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PROCEEDINGS OF A SEMINAR ON AIR POLLUTION PROBLEMS, HELD AT THE ROBERT A. TAFT SANITARY ENGINEERING CENTER, CINCINNATI, OHIO, ON SEPTEMBER 20-21, 1955

Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

1955

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SEMINAR ON AIR POLLUTION PROBLEMS

Held at
The Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio
September 20-21, 1955

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46

FOREWORD

The major objective of the Public Health Service, with respect to community air pollution, is to assist State and local agencies. This responsibility necessitates, among other things, the sponsorship of a vigorous program of training State and local air pollution personnel.

In working toward fulfilling this responsibility, a Seminar on the organization and administration of State air pollution programs was conducted at the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio, on September 20 and 21, 1955. The objective of the Seminar was to provide an opportunity, particularly for representatives of State governmental agencies, to discuss common problems relating to the organization and administration of air pollution activities. Invitations to attend were extended to representatives designated by each State and territorial government, counties having air pollution control organizations, and cities of over half a million corporate population.

This volume contains the proceedings of that Seminar.

CONTENTS

Page

List of Registrants 1

GENERAL INTRODUCTION TO PROBLEMS 7
Chairman, Harry G. Hanson, Director
Robert A. Taft Sanitary Engineering Center

Welcoming Address — Federal Interest in Air Pollution 8
Wesley E. Gilbertson, Assistant Chief
Division of Sanitary Engineering Services
U. S. Public Health Service, Washington, D. C.

History of the Air Pollution Problem 10
Dr. Louis C. McCabe, Scientist Director, Air Pollution
U. S. Public Health Service, Washington, D. C.

Public Health Aspects of Air Pollution 16
Dr. Milton M. Fisher, Chief, Community Air Pollution
Medical Program, Division of Special Health Services
U. S. Public Health Service, Washington, D. C.

Air Pollution Research 21
Dr. Leslie A. Chambers, Director of Research
Robert A. Taft Sanitary Engineering Center

Air Pollution Program of the Division of Sanitary Engineering Services 27
Arthur C. Stern, Chief, Community Air Pollution Program
Robert A. Taft Sanitary Engineering Center

LOCAL AIR POLLUTION CONTROL PROBLEMS 39
Chairman, Harry C. Ballman, Executive Secretary
Air Pollution Control Association, Pittsburgh, Pennsylvania

Problems in Official Municipal Air Pollution Control Enforcement 39
Dr. Leonard Greenburg, Commissioner of Air Pollution Control
City of New York

Typical Air Pollution Ordinance Provisions 45
Charles W. Gruber, Chief Smoke Inspector
City of Cincinnati, Ohio

Page

Equipment Standards 50
H. Kenneth Kugel, Chief Engineer
Smoke Regulation and Boiler Inspection
Government of the District of Columbia

Permits, Registration, and Certificates of Operation 61
Howard J. Scott, Commissioner
Division of Air Pollution Control
City of Cleveland, Ohio

Fuel Regulations 66
James H. Carter, Commissioner
Division of Smoke Regulation
City of St. Louis, Missouri

Movie — "Smog Men at Work"

STATE AIR POLLUTION CONTROL PROBLEMS 72
Chairman, Joseph E. Flanagan, Jr., Assistant Director
Robert A. Taft Sanitary Engineering Center

Experiences in Developing a State-Wide Air Pollution
Control Program 72
Curtiss M. Everts, Jr., Director
Division of Sanitation and Engineering
Oregon State Board of Health, Portland, Oregon

Typical Legislative Provisions 90
Jacob S. Sharrah, Assistant Director
Bureau of Industrial Hygiene
Pennsylvania Department of Health
Harrisburg, Pennsylvania

State-Municipal Relations 94
John C. Collins, Senior Chemist
Division of Sanitary Engineering
Massachusetts Department of Health
Boston, Massachusetts

State-Interagency Relationships 98
Frank M. Stead, Chief, Division of Environmental Sanitation
California Department of Public Health, Berkeley, California

State-Federal Relations 107
Vernon G. MacKenzie, Assistant Chief, Research and Development
Division of Sanitary Engineering Services
U. S. Public Health Service, Washington, D. C.

Page

PLANNING CONSIDERATIONS 111
Chairman, Arthur C. Stern, Chief, Community
Air Pollution Program
Robert A. Taft Sanitary Engineering Center

Training 111
Harry P. Kramer, Chief, Training Section
Robert A. Taft Sanitary Engineering Center

All-Purpose Air Pollution Test Facility 117
L. M. K. Boelter, Professor of Engineering
University of California, Berkeley, California

Panel Discussion on Personnel Needs 118
J. Robert Cameron
Director, Division of Environmental Sanitation
Department of Health and Hospital
City and County of Denver, Colorado

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Chief, Industrial Hygiene
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Panel Discussion on Equipment and Laboratory Needs 125
Jack Baliff, Chief, Engineering Unit
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New York State Department of Labor

Bernard D. Bloomfield, Ventilation Engineer
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Page

Panel Discussion on Equipment and Laboratory Needs
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Howard J. Scott
Commissioner, Division of Air Pollution Control
City of Cleveland, Ohio

Panel Discussion on Budgetary Needs 133
Harry C. Ballman
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Air Pollution Control Association, Mellon Institute
Pittsburgh, Pennsylvania

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Chief Sanitary Engineer
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Panel Discussion on Budgetary Needs
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GENERAL INTRODUCTION TO PROBLEMS

Tuesday, September 20, 1955 - Morning Session

Harry G. Hanson, Chairman

HANSON: We are genuinely appreciative of your response to the invitation to attend this Seminar. At the last count it appears we have in attendance 43 representatives from 31 States and the District of Columbia, 5 representatives from 5 counties, 21 representatives from 14 cities. In addition, we have representation from some of the other departments of Government, such as the Weather Bureau, Bureau of Mines, Tennessee Valley Authority, as well as representatives from the Regional Offices of the Public Health Service.

The purpose of this Seminar is to provide an opportunity, particularly for representatives of State and Governmental agencies, to discuss common problems relating to the organization and administration of air pollution control activities. This meeting has been cast in the framework of a seminar in order to encourage full, free, and open discussion.

As you know, this is our first experience with this particular type of conference. In fact, to our knowledge, this is the first seminar of this particular kind that has been held. It is, therefore, the first opportunity since passage of the Air Pollution Act for the Public Health Service to meet a good many of you. We especially appreciate this opportunity to hear your views, to hear of your problems, and to receive your suggestions regarding the way in which we can best carry out the responsibilities Congress has assigned to us. Since many of our Staff members here are new, we are anxious to utilize this opportunity for them to meet you and for them to hear your views. We have made provision for a number of them to sit as observers for this purpose.

It has been suggested that the record of this Seminar be made available to participants and others interested in the form of a proceedings. Accordingly, arrangements have been made for recording of presentations and discussions. We will need your cooperation on this, particularly in the form of editing your own comments before incorporation in the proceedings.

We are now ready to proceed with our Seminar, and it is my pleasure to introduce to you, Mr. Wesley E. Gilbertson, who will speak on the subject of Federal interest in air pollution. Mr. Gilbertson is here in place of Assistant Surgeon General Mark D. Hollis, who was unable to be here.

Welcoming Address - Federal Interest in Air Pollution

Wesley E. Gilbertson

It is a real honor and a great privilege for me to extend a warm welcome to this Seminar on air pollution problems. On behalf of Surgeon General Leonard Scheele; Assistant Surgeon General Otis Anderson, Chief of the Bureau of State Services; and Assistant Surgeon General Mark Hollis, Chief Engineer of the Public Health Service, I wish to extend greetings and best wishes for a successful and pleasant meeting. Because of the emergency due to the hurricane, Mr. Hollis is unable to be present and he asks that I express his deep regrets.

This is the first such conference which has been sponsored by the Public Health Service, a fact that is surprising in itself when one considers the importance of the air pollution problem — as related to health — and as related to all other harmful effects. We most sincerely hope that this Seminar will be the beginning of an effective and fruitful joint effort in attacking a problem which is growing in complexity and severity — a problem on which a vocal and alarmed public is asking some relief.

In acting as your host for this meeting of air pollution specialists, gathered here from all parts of the Nation — representing many States, cities, counties, and other Federal agencies — we feel very humble, because we, as an organization, have only relatively recently undertaken any significant activities in this field. For a number of years, however, there has been a growing interest in this Service — and in other Federal agencies — on various aspects of the air pollution problem. This interest has been activated, in large measure, by requests for consultation or technical services from State and local organizations in regard to specific problems.

I believe it is fair to state that Public Law 159, the air pollution legislation which was enacted by the first Session of the 84th Congress, embodies the basic concept which has grown out of this relationship. The preamble to this Act states, "That in recognition of the dangers to the public health and welfare, injury to agricultural crops and livestock, damage to and deterioration of property, and hazards to air and ground transportation, from air pollution, it is hereby declared to be the policy of Congress to preserve and protect the primary responsibilities and rights of the States and local governments in controlling air pollution, to support and aid technical research to devise and develop methods of abating such pollution, and to provide Federal technical services and financial aid to State and local government air pollution control agencies and other public or private agencies and institutions in the formulation and execution of their air pollution abatement research programs."

It is our firm conviction that this declaration of policy provides a logical and sound foundation for developing Federal activities in the field of air pollution. This cooperative approach may well be blazing new trails in local — State — Federal relationships. The authorizations in Public Law 159 provide for the conduct of research, investigations, training, demonstrations, and dissemination of information on air pollution. Activities may be carried out through direct operations of this agency or other Federal agencies, or by means of contracts with or grants to other public and private agencies and institutions. It is the intention of the Public Health Service to utilize fully the provisions of the Act which provide for cooperative work with other organizations -- local, State, and Federal. This is a matter both of principle and of necessity, when one views the enormous complexity and scope of problem in comparison with the resources available to cope with it. We hope to be able to develop research and investigations which will serve to fill some of the gaps, and will also stimulate and encourage other studies, financed from other sources, to obtain needed solutions. Initial steps are being taken along these lines to set up carefully planned investigations in certain problem areas, to activate research grants, to begin training activities, and to develop joint programs with such other Federal agencies as the National Bureau of Standards, Weather Bureau, and Bureau of Mines. More detail will be presented on all of these aspects of the program during our sessions.

This meeting, we feel, is a very important opportunity to share -- firsthand — some of the problems which we have in common, and to discuss them. We have hoped and planned that these sessions will be carried out in an informal atmosphere, which will permit full and frank discussions of pertinent issues. I trust that you will agree that we are not gathered here to act as a deliberative body to make decisions on jurisdictional and related matters, which are quite beyond the scope of this Seminar.

A number of you have indicated by correspondence or verbally your desire to discuss individual State or local matters with either representatives of the Public Health Service, or with others from States or communities in attendance here. We regret that it has been impossible to set up any firm schedule for such individual meetings. Those of you who would like to discuss matters with anyone in attendance, can feel free to use the facilities of the Center, Thursday and Friday, and meetings can be set up for either of these days. We will be glad to provide conference room space for those who wish to have such discussions. Mr. Hanson and Mr. Stern will be glad to make arrangements for those who wish to discuss these matters with any of the folks on our staff.

In closing, I want to say again how happy we are to have you here. We are very impressed with the enthusiastic response to our invitation to attend this Seminar. It speaks well for our future relationships in working on the grave problem of air pollution in the interests of our employers -- the public.

History of the Air Pollution Problem

Dr. Louis C. McCabe

There is ample evidence of air pollution in antiquity. Roman history records that Pliny the Elder was killed by volcanic fumes from an eruption of Mount Vesuvius in 80 A.D., when he went by boat to rescue a friend living on the sea near the volcano. Other natural sources, such as dust blown by the wind and burning forests, undoubtedly were experienced before the use of fire.

Dust and fumes from volcanoes were observed in the haziness of the atmosphere for several years after the eruption of Krakatoa in 1883, and from Katmai in 1902. Of recent memory, are the forest fires in Alberta and the Mackenzie district of Canada, which in 1951, laid a smoke pall over the eastern United States from Chicago to Philadelphia. While the weight of contaminants of natural origin in the earth's gaseous envelope is greater than man's activities, our concern is with the pollution of our own making which is discharged into the little space in which we live.

Bituminous coal was introduced as a fuel in England in the thirteenth century, and in 1303 a decree was passed forbidding its use. Many authorities are cited against the use of coal from this time on. The widespread effect of smoke was sufficiently realized, but city dwellers became so hardened to it as to be oblivious of its presence. As populations and industry grew, wood was exhausted and replaced by coal. It was realized that the growing smoke nuisance was the result of chemical decomposition of coal with insufficient air for complete combustion. The causes of smoke and methods for its prevention were subjects of an English commission in 1881, a German smoke commission in 1894, and a French commission in the same year. The Smoke Abatement Society of Leeds was formed in 1890 to determine the nature and extent of atmospheric impurities arising from coal smoke, to consider coal consumption in boilers, furnaces, and domestic fireplaces, and to examine the existing system for controlling the emission of smoke.

Although there had been private litigation with regard to smoke in St. Louis as early as 1864, the first ordinance in this country giving specific authority to a local government to regulate it, was adopted by Chicago in April 1881. It stated that the emission of smoke from the smokestack of any boat or locomotive, or from any chimney anywhere within the city shall be a public nuisance. Enforcement was divided between the police and health departments. No standards of smoke density could be maintained, and many believed that smoke could not be prevented. Cincinnati adopted a smoke ordinance in November 1881, and St. Louis in 1893. The latter stated that the emission of dense black or thick gray smoke is a nuisance and authorized the drafting of regulations limiting and defining permissible smoke emissions, and for testing smoke prevention devices. By 1912, 23 of 28 cities with more than 200,000 population had smoke abatement programs.

"Smoke" in these early years included about all the air contaminants. In the study of emissions from the Selby smelter, the Bureau of Mines bulletin "Metallurgical Smoke" defines smoke as "gases and vapors, and the fine dust entrained by them, that issue from the throat of furnaces, such as blast furnaces, reverberatory smelting furnaces, or roasting furnaces." Eventually smoke was defined as small gas and air-borne particles (usually not larger than one micron in diameter) consisting essentially of carbonaceous material, in sufficient number to be observable. The American Society of Mechanical Engineers later defined "dust" as gas and air-borne particles larger than one micron in mean diameter.

About the turn of the century, Professor Ringelmann in France, developed a chart showing different shades from 20 to 80 percent black to be used in evaluating smoke density. It was first used extensively in this country in the fuel testing experiments of the Technologic Branch (later the U. S. Bureau of Mines) of the Geological Survey at the St. Louis World's Fair. Since 1908, the Bureau of Mines has printed the Ringelmann charts for free distribution. The Umbrascope, which employs shaded glass in a telescope type holder for comparison with smoke under observation, appeared shortly afterward. More recently the Smoke Scope, employing the principle of the Nyder gun sight to determine the density of a smoke column, has been developed.

Many objections have been raised to the shade method of determining smoke density. Barkley states, "these comments and objections, however accurate, become inconsequential when the entire purpose of the readings is considered. The purpose is not merely to fine some violator because smoke of a certain shade has been emitted, concerning which it may be argued just what percentage of blackness occurred or how many black particles were emitted. The purpose is to lessen smoke emission and to improve cooperation in making a cleaner neighborhood. The smoke-chart scheme has proved effective and is simple; moreover, no more practical method has been devised."

Stack discharges are sometimes gray or otherwise colored. In such instances the Ringelmann smoke chart is not applicable. The regulations of the Los Angeles Air Pollution District avoid this difficulty by adding a section which prohibits discharges "of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke" of number 2 Ringelmann.

In 1940, St. Louis placed a limit of 21 percent on the volatile matter in coal burned in hand fired equipment, but permitted the use of higher volatile coal where it could be burned smokelessly in approved mechanical equipment. The City of Pittsburgh passed a similar low-volatile ordinance in 1941, but it did not become fully operative until October 1947. Allegheny County followed Pittsburgh with a similar ordinance in 1949. The problems in these three jurisdictions were quite similar and there was marked reduction of smoke in their atmospheres.

The St. Louis ordinance required that high sulfur coals be washed to remove as much of the sulfur-bearing pyrites as possible before the coal was delivered to the consumer. This, and the fact that the low-volatile coals going to the St. Louis market after initiation of the regulations were generally low in sulfur, was largely responsible for a reduction of 83 percent in sulfur dioxide in winter months and 73 percent in summer.

Sulfur dioxide concentrations now found in the downtown areas of St. Louis are comparable to those found in suburban areas 1 to 20 miles from the city, 13 or 14 years ago. Repainting need not be done so frequently, and stone and metals do not suffer corrosion damage as formerly. Plants which could not be grown within the city in 1936 are now as hardy there, as in the outlying areas. The diurnal variations of sulfur dioxide concentrations also reflect the marked reductions.

Early in this century, experimental methods provided a generally satisfactory means for diffusion of sulfur dixoide from high stacks in smelter operations. The first theoretical application of diffusion of smoke from chimneys under average conditions was that of Bosanquet and Pearson. Sutton's equations for diffusion of gases from a continuous point source then introduced a factor for varying atmospheric turbulence. Since World War II, many papers on the general problem of dispersion of contaminants have appeared.

The work of O'Gara, as early as 1915, showed that sulfur dioxide from 200- and 300-foot stacks at Murray, Utah, frequently reached the ground in sufficient concentration to injure crops. At a later date, a stack 450 feet in height was built, and the gases were diluted fourfold by a fan at the base of the stack. Increase in stack height reduced ground concentration, but the dilution of sulfur dioxide by the addition of cold air, caused the gases to settle nearer the stack. Although the concentration in the stack was lower than before, the fan was installed, the concentration of sulfur dioxide coming in contact with vegetation near the stack was higher than previously. Installation of a furnace at the base of the stack led O'Gara to conclude that each °F. increase in temperature of the exit gases was the equivalent of 2.5 feet of added stack.

When high sulfur coals are burned, the sulfur dioxide content of the stack effluent may range between 0.20 and 0.40 percent. At Trail, British Columbia, essentially 100 percent of the sulfur dioxide is recovered from 1 percent sulfur dioxide zinc roaster gas through the use of 30 percent ammonia as the absorbent. The residual sulfur dioxide content of the exit gases is 0.15 to 0.20 percent. Unless cheap ammonia is available, this process is not attractive for the recovery of sulfur dioxide encountered in coal fired plants.

Before the war the flue gases at Battersea and Fulham power stations in London were treated to remove oxides of sulfur. The treatment plants were shut down during the war because their white plumes were so easily visible from the air. Two thirds of the flue gases are again being treated at Battersea, but the practice has not been reinstated at Fulham.

The flue gas at Battersea is washed with large volumes of river water, to which chalk has been added, so that the calcium sulfate formed remains in solution and can be discharged into the river. This process removes more than 90 percent of the sulfur compounds, but nothing is recovered. Craxford estimates the cost to be about 7 shillings (98 cents) per ton of coal burned. The process requires such a large quantity of water to keep the calcium sulfate in solution that the full flow of the Thames will be required for these two plants.

Regulation of the Los Angeles County Air Pollution Control District limit sulfur dioxide in stack gases to 0.20 percent by volume at standard conditions. This has had the effect of requiring the collection of sulfur compounds to a total of 600 or 700 tons daily of sulfur dioxide equivalent.

Dust loading requirements of different ordinances vary greatly. New York in 1938, set a limit of 400 grains of "cinders" per 1,000 cubic feet of gases, but did not indicate the temperature of the gases. St. Louis in 1940, set 0.75 grains per cubic foot at stack temperature, 0.2 grains of which should be of a size to be retained on a 325 mesh sieve. The American Society of Mechanical Engineers recommended a lower limitation, in which size designation was ignored. Los Angeles County in 1949, adopted the mass-rate regulation which establishes a range of limitations on allowable discharge per hour of solids based upon weight per hour of process material.

In 1950, A. J. Haagen-Smit, of California Institute of Technology, offered an explanation of the origin of the Los Angeles smog. He suggested that the hydrocarbons in the air could be oxidized to produce the compounds which would damage plants and cause eye irritation. This explanation was not immediately given the attention it deserved, but Haagen-Smit's recent careful control test chamber experiments for the Los Angeles Air Pollution Control District have demonstrated the accuracy of his original theory. Some 50 compounds possibly present in the air were tested on their ability to cause smog damage to plants — without success. However, when the reaction products of ozone with unsaturated hydrocarbons were tried, typical smog damage resulted.

The ozonization was carried out in vapor phase by bringing the vapors of the hydrocarbons into contact with the ozone. When the two streams meet, a dense aerosol is formed. As a source of the hydrocarbons 10° fractions of a cracked gasoline were used. (All gasoline now available is cracked and contains 20 percent of olefins or unsaturated hydrocarbons. The straightrun gasoline formerly used contained no more than 1 percent of olefins.) It was found that the maximum of typical plant damage occurred with the oxidation products of low boiling hydrocarbons.

After these encouraging results, a series of pure olefins was tried in the ozone fumigation experiments. Maximum damage was found to occur with olefins of a chain length of five to six carbon atoms with the double bond in the end position.

During these oxidations, a series of products are formed, with aldehydes and acids as end products. Fumigation experiments with these show that they are not responsible for the typical damage. He concluded, therefore, that the series of peroxides formed by the addition of ozone to the double bond are the active agents in causing the typical smog damage. Threshold determinations carried out on 1-n-hexene showed that oxidation of this hydrocarbon with a concentration of ozone as low as 0.05 part per million still causesslight but typical smog damage.

It is reasonable to assume that in the Los Angeles atmosphere where olefins are available, the ozone which occurs in unpolluted air in concentrations of 0.05-0.08 part per million, combines with hydrocarbons released in the area to produce material causing crop damage. However, the extent of the damage experienced when a smog wave hits the plants, leads one to suspect that there are additional means by which oxidized hydrocarbons could be formed.

It has been shown that oil fractions acquire weed killing properties when exposed to the action of sunlight and oxygen. Saturated as well as unsaturated hydrocarbons are thereby oxidized, yielding peroxides and their conversion products, aldehydes and acids.

A third way of oxidizing the hydrocarbons was found in the plant experiments when oxides of nitrogen were used together with olefins. These oxides add to the double bond of the hydrocarbon and form nitrosates and nitrosites. Fumes are produced which can be eye-irritating when the reaction is taking place too violently, as in the case of butadiene, through the formation of nitro-olefins. While the nitrosates and nitrosites are not causing plant damage at concentrations lower than 1 part per million, one of the nitro-olefins, nitro-ethylene (a very efficient lachrymator) did produce smog symptoms at concentrations of 0.1 part per million. The presence of this compound in the air has not been established, although there is evidence that some of the higher nitro-olefins do occur, since small amounts of their polymers are found in the filter paper extracts.

Since it was known that the nitrogen oxides may function as oxidation catalysts under the influence of light, plant fumigations were also carried out with nitrogen dioxide and the olefins under ultraviolet light. Typical smog damage was produced on the plants with both gasoline and 1-n-hexene. These symptoms can be produced readily in sunlight since, from chemical evidence, it is known that the upper limit of the photocatalytic action of nitrogen dioxide is at approximately 4300°A., a wave length of light within the range of wave lengths received from the sun at the earth's surface. Under the influence of the light, the reaction, $NO_2 \rightarrow NO + O$, furnishes atomic oxygen which is available for the oxidation of the hydrocarbons.

The work of Haagen-Smit placed emphasis on the loss of hydrocarbons from refinery operations, storage and transportation of liquid fuels, and loss of gasoline from automobile exhausts as important sources of smog. The regulations of the Los Angeles District now provide for control of refinery losses and research has been initiated for the purpose of reducing transportation and automobile exhaust losses.

In recent years, more attention has been directed to combustible rubbish as a source of air pollution. When sanitary fill is properly operated, it offers a satisfactory solution of the waste disposal problem, but as available land is utilized, there is usually no choice of disposal method left but municipal incineration. More research into the design of large and small incinerators is needed, and there are indications that this will be done.

Throughout the record, there is frequent reference to the effects of air pollution on health, and most legislation is in part at least, based on the assumption that there are ill effects. The relationship is difficult to establish. Even from the standpoint of a relatively severe short-time exposure the answers do not come easily. This is borne out by the fact that the intensive study of the Meuse Valley, Donora, and London incidents failed to reveal conclusive answers to all the questions which were raised. This can be attributed in a large measure to the fact that investigations of such occurrences take place after they are over and not while they are going on. The general conclusion of the Donora study was that no single polluting agent was present in sufficient quantity to account for the effects on the population, but that apparently some combination of contaminants occurred which was responsible. Bearing in mind the difficulties in studying these effects of a severe short-time occurrence, it is possible to visualize the problem of evaluating the more nebulous effects of long-time exposure to much smaller amounts of contamination. In the latter case, one has much more opportunity to study the contamination itself, and in this phase of the work, considerable progress is being made.

A much more difficult challenge is that of studying the possible effects of atmospheric contaminants on the general health of the persons exposed. This introduces an epidemiological problem of major proportions. To date, no comprehensive conclusive studies have ever been made on any population group for the purpose of evaluating the chronic effects of exposure to air pollution. The Detroit-Windsor international program includes an approach to this problem. A study of the proposed plan for this group gives an idea of the variables which must be taken into consideration in such a study. Such factors as density of population, economic status, race, education, must all be evaluated. This will, of course, ultimately produce information as to the health of various groups.

Public Law 159 of the 84th Congress, which was signed on July 14, 1955, for the first time, provides an appreciable sum of money for investigating the effects of atmospheric pollution on health. This may make possible an answer to the question which arose in the early history of air pollution -- is there a relation between air pollution and chronic disease?

Public Health Aspects of Air Pollution

Dr. Wilton M. Fisher

We shall talk loosely of health effects or medical effects of air pollution as if they comprise an accepted and recognized medical picture. That is for convenience only. We do not yet know of a specific medical characteristic resulting from air pollution. There is a considerable body of conjecture. There are reams and reams of words. There are scattered observations -- very widely scattered -- which suggest eventually we can develop a picture of medical effects of air pollution. At least, we're trying. There are reports and casual observations and conversational reports of effects of air pollution and air pollutants coming from a number of agencies and a number of institutions throughout the world, sporadically, and throughout the United States constantly. We are trying very hard to begin to pull those reports together to see if they can be compared to see if they mean anything and to see what use can be made of them in planning future activities. We are favored by being able to attend this seminar where we can ask that each of you give us any information you may uncover at any time -- whether it relates to past history, current happenings, or to future developments. With our present staff of two we cannot cover the country in the first year. We have to have a lot of help.

You have heard of two kinds of air pollution health effects. One of these is related to the acute, or disaster pollution episode, such as occurred in the Meuse Valley, in London, and in Donora. They are almost the only points of reference for massive effect of air pollutants on health.

These episodes are characterized by unusual circumstances which give rise to a sudden build-up of air pollutants chronically present in the area, to a level far above that expected.

The other part of the picture is the long-term pollution effect. Much of the emphasis with respect to air pollution illness or health effects has been placed on the acute episodes. However, it is fundamental that we give attention to what happens to people who are exposed for long periods of time to different concentrations of pollutants. We are looking to Mr. Stern eventually for information as to which of the communities in the country are polluted; whether the pollution consists of single agents, or mixtures of contaminants; whether it stems from a single industry, or whether two or more are involved.

As you have already heard, the studies of the acute episodes were all retrospective. Unfortunately, in addition to the chemical, physical, and meteorological studies, much of the medical investigation was in retrospect. You know the classic experience of retrospective surveys of human illness. Some folk cannot report reliably on death in the family after a lapse of twelve months. The seeking of history of minor illness, of minor disturbances which disappear rapidly after a two month survey lag, often is quite difficult.

We will consider air pollution health effects as an epidemiological problem, and as an epidemiological problem, air pollution health effects can fit in fairly well to the classical epidemiological study pattern. The epidemic is a relatively unusual episode in the course of a disease and is quite atypical of the endemic or usual state of affairs. As we are aware, smog produces epidemics too. And these epidemics from smog have much the same relation to air pollution in general as do outbreaks of food-borne infections to Salmonella infections in general. In both situations, a complete understanding is almost certainly dependent upon a knowledge of the chronic endemic problems. There again, we are looking for information both physically, chemically, meteorologically, as an integral part of health aspects of chronic long-time pollution problems. The early health effects of air pollution -- those which go along with minor or beginning air pollutants -- are chiefly those of nuisance and I leave that to you for your evaluation. We've been over, around, and under the matter of nuisance and odors as a health effect. They certainly contribute to social health, and to the psychological status of the population, either as a contribution to a state of well-being or to one of uneasiness and discomfort. Nuisance and the reaction to odor remain to be evaluated. It's going to be a very difficult evaluation to try to make.

Dr. McCabe talked of the hydrocarbon-nitrous oxide-sulfur dioxide mixtures. We'll leave off the sulfur mixture for the moment, but we'll talk about the nitrous oxide-hydrocarbon series. I just heard of some considerable confusion and lack of reproducibility -- lack of constancy if you will -- in the laboratory experiments now in process. Let us say that lung cancer of an endogenous sort has been shown in mice after exposure to some components of air contamination which were in tremendous dose; it was implied that these materials might contribute to the production of exogenous cancer. Evidence that these hydrocarbons may in themselves cause cancer is a problem of half a dozen research projects under way at present. We'll take a careful view of the reported findings as they relate to humans. As you well know, cancer of the skin of a rabbit, cancer of the skin of a mouse, or cancer of the lung of a mouse may or may not be applicable to human findings. We find it almost impossible from the standpoint of the physiological laboratory or the toxicological laboratory to isolate and work with these interacting substances to which Dr. McCabe referred. We must determine how these substances, of a very short life as chemical entities, can be tested on animals during a period of days, or months; this is a serious problem in our health effect studies. We must work with very low levels of atmospheric pollutants over a long period of time in a human or animal population and look for an effect. We don't know where to expect the effect, and we don't know how to measure the effect — we shall simply try it and see what comes out. We may start comparing A and B and at last we find out we've been comparing A with X and the "X" we do not know at all.

A peculiar thing isseen when people are exposed to air pollutants in a heavy dosage for a few days both in these acute episodes and in the long-time pollution problems. You see a symptom you heard referred to awhile ago — lacrimation (eye irritation), which has been reported a half dozen times as appearing very early. It's one of the first things that happen in the way of human response to the presence of increased air pollutants in some places. The smog can continue for two, three, four, or five days longer. Once in awhile we find that the eye effects disappeared after the first day. They may return a little later in the process or they may not. Exactly the same precursor components are still in the air, as far as we know. The human reaction dwindles away and practically disappears. That is provocative of the whole chain of research thinking. Is there immunization or is there rapid development of tolerance to air pollutants as such? We know that air pollution can contribute to disabling illness. We've seen it. The condition of smog in London, Donora, Meuse Valley can contribute to disabling illness, namely, cardiac cases, people with impaired lungs, asthmatics, and the like. Most people of 45-55 years of age and older do poorly and death occurs in these age groups during times of severe smog concentration. The temptation to say that smog did it is great. We say that smog or some component of smog, is a secondary or a contributing factor. We don't dare go further. We may learn from our laboratories that there are particular elements which cause death. There are studies under way now with laboratory animals with a lung or cardiac impairment. Dr. Stokinger had some very interesting results from the exposure to ozone of animals subject to stress. We may consider smog as a contributing mechanism -- not as a primary etiological factor in death or in serious disabling illness. It may simply provoke illness -- it may simply precipitate illness in those who are already physical cripples.

We mention the psychological effects of air pollution. The matter of a feeling of dirtiness, the problem of interference of sunlight, and the problem of odors have all been mentioned repeatedly. Is a person more irritable, or not? Are our school children less responsive to schoolroom restrictions during a period of smog? We have some interest in the results of technical performance tests during conditions of smog. This provides an evaluated psychological factor. How well can persons perform routine standardized tests? The whole matter of the psychology of smog is wide open.

There are suggested effects on the skin. These you'll find mostly through occupational health studies. There's not too much evidence pointing toward a cutaneous effect of air pollution as a community matter.

Inhalation studies are the most likely of all the research projects under way, in the determination of the effect on the lung or respiratory system of air pollutants. From the medical end, we are interested chiefly in particulate matter only in the size of one micron and below. That is the level where it's most difficult to clean the air and it's most difficult for natural cleaning to occur. It is the particle of one micron or below which gets into the lung and into the alveolus. Even so-called inert dust particles may be of importance in air pollution in that they may absorb or adsorb, act as carriers, act as synergists, or act as buffers for vapors, gases, liquids, aerosols in the atmosphere. Now for example, formaldehyde pumped into a cage will kill a few mice over a relatively long period of time. The effect is chiefly a respiratory effect. A much lesser dose of formaldehyde on inert dusts of two microns or less in size will get right down to the lung alveolus and the mouse will die of pneumonia in a matter of 24-36 hours.

The medical program as we've already mentioned will depend on a small full time staff. It will sponsor studies, which by their very nature must be cooperative, through three budgetary methods. We have available for expenditure during this year a certain amount of direct operating funds to be used to support toxicology studies at the Occupational Health Field Headquarters, and the development and maintenance of a relatively small basic staff at Washington, chiefly concerned with statistical studies and epidemiological studies. We have available through the N.I.H. mechanism, the research grants procedure. These are the usual N.I.H. research grants finaced by transfer of air pollution funds. To fill in between the intramural activity of direct operational research, and the research grants, we shall use contractual research. It's new in the Public Health Service for this program. We'll be using it, and Mr. Stern will be using it where we can contract with various agencies who can help us get the job done. There are other minor aspects -- minor parts of the budgetary provisions that would be covered best by someone else. Using these three procedures, we are going to try to explore and to develop the medical picture. To appraise the picture, use will be made of epidemiological studies -- basic mortality and morbidity data on metropolitan and nonmetropolitan areas; morbidity and mortality data from people who are physically impaired; and other approaches. We are already involved in toxicity studies of particular components of smog. Organ function tests, that is, physiological response to air pollutants, remain to be developed. We expect to have that under way on a minor basis very soon. As we have mentioned, psychology is still a wide open field for study, suggestion, or opinion.

BALIMAN: Doctor, you have been talking about the primary effects of air pollution on an individual (which I think is important and should have first consideration), on livestock and vegetation. Is there an area of interest in studying the secondary effects on individuals from vegetation that has absorbed large amounts of air pollution?

MC CABE: The Department of Agriculture is doing no direct work, but they do support a considerable amount of work by grants; and for instance, they told me a short time ago that they have sponsored the study of 700 cattle in the Tennessee Valley that are test animals for exposure to fluorides -- so there is work of that kind going on, but it's primarily through the support of funds given to the State universities and agricultural schools by the Department of Agriculture.

BALIMAN: Fluorides then have been the problem?

MC CABE: Fluorides have been the major problem.

BALIMAN: Does sulphur increase in vegetation exposed to atmospheres polluted with sulphur compounds? For instance, in leafy vegetables, is there a sulphur buildup which would affect human beings consuming them?

MC CABE: Normally, it is observed that at about 4/10 parts per million, certain specific types of plants will be affected by SO_2 — for instance, in a city where the SO_2 is consistently at 4/10 parts per million, you can't grow conifers. There is some work going on even yet as to mechanism, but it is pretty well established I think — the level that plants will tolerate SO_2. There is work going on in California, as you know, through the State university, and in the Los Angeles District, on the effect of hydrocarbons on plants.

BALIMAN: You're speaking of the adverse effect of air pollutants on the appearance of plants — you're not talking about the effect on human beings who have consumed foods exposed to polluted atmospheres. My point is — if there is no adverse effect on the human being consuming the food, regardless of appearance, the leafy vegetables are still edible. Is there any correlation between the increased content of chemicals in vegetation caused by air pollutants, and the individual who eats it?

MC CABE: Certainly not, as far as SO_2 is concerned. I never have heard any implication that that's the case. In the case of fluorides, it might be.

STEAD: These questions that have just recently been discussed direct attention to the real "nubbin" of this question — it gets down, I think, to a closed system in which chemical substances and other substances, biological factors, are recycled in a closed environmental system over whole lifetimes of plant, animal, bird, and human life. Some of the opening statements made by Dr. Fisher very clearly and eloquently point up the state of affairs which chemically might be summed up about like this.

It is not possible at the moment to identify the chemical compounds that are dynamic, and in a state of change, present at any one instant in the ambient air. If you collect the components from several thousand cubic feet of air by freeze-out, you have no assurance at all that the compounds that you ended up with in that freeze-out tube, are in the same state of chemistry that they were in the ambient air. If you try to make a synthetic air mixture, you have no assurance that it is the true prototype. Somewhere along the line it is necessary to reproduce this complex system that is going on, with everything in it, the full spectrum of plant, animal life, waste discharges, and whatnot. There has been under study at the University of California, in the so-called "crash" research program, one study project dealing with the feasibility of doing this thing — reproducing (enclosing, so to speak) a sizeable chunk of the environment with all of the field variables present, and the ambient air under management.

MAC KENZIE: With respect to Mr. Ballman's comment about indirect effects, there is recent report that gives some hint in that particular direction — this is again related to fluoride air pollution. In a study of the dental mottling among school children in two adjacent areas, it was found that in one of them subject to fluoride air pollution, the degree of mottling was considerably more than could be accounted by the intake of fluoride in the public water supply used in the area. No definitive data are available as to the source of fluoride that the children were getting to produce the excess degree of mottling, but air pollution, in this particular instance, is under suspicion possibly through the accumulation of fluoride on crops and vegetables that might be used.

FISHER: The question of allergies was raised a while ago. That is a part of the medical picture of course, but there is one other aspect of human disease under consideration — the effect of air pollutants on respiratory diseases of man — that is, the effects on specific infectious agents. The British have described a reproducible — a large enough number to figure it to be a constant finding of the effect of air pollution on people with bronchitis, who were already known to be infected with hemophilus influenzae, who did much more poorly during smog episodes than did people in the same clinical category without the specific infection.

Air Pollution Research

Dr. Leslie A. Chambers

When one sees on a program a title that is as vague and unlimited as Air Pollution Research, he is entitled to assume one of several things. The subject may be included because it is conventional — no conference ought to be without one. Or there is some character around whose position is such that he can't very well be left out althgether, although he has nothing much to contribute. Or there is believed to be so much controversy entailed in the rest of the program, that a few facts and a bit of philosophy are needed to provide some form of prophylactic sedation.

Whatever the reason, Air Pollution Research is my subject, and I feel quite free to impose on you what should be recognized as an entirely personal and altogether transient interpretation. I'd like to start well back on this subject, with the consideration of what is research, and what have been the characteristics of research in the field of air pollution. Research has been indulged in (spelled r-e-s-e-a-r-c-h) in this field for at least fifty years, research at various levels of disciplinary competence and with variously pointed objectives. The result has been the accumulation of a large mass of publications containing some usable data. The unfortunate part of a lot of it is that it appears that research has been pronounced in two different ways by investigators. There have been a few, such as Professor Haagen-Smit who have actually investigated the problem -- sought an answer to, or sought a definition of the problem. There have been others who have repeated that search; in other words, we have had "research" and "ree-search". We have had recent occasion to examine the so-called research data with reference to diesel exhaust gases. It was found that of 75 papers which I have been able to accumulate, possible 4 actually contained new data or observations which could be defined as contributions. The balance of them actually contained repetitions, quotations, and restudies of exactly the same information. So, it is necessary to regard our wealth of publications as rather incomplete.

There is a logical sequence and a necessary set of events that must occur in research. First of all, we have to have a definition of a problem before we can investigate it. In order to have the definitions of a problem, we've got to have in hand, measurements of the system which we are trying to examine -- the characteristics of which we are trying to define, and in order to make those measurements, we must have methods for making the measurements. Now, all of these things will have to proceed under development simultaneously. After we have made measurements, collected the data, then it is necessary to sit down and devise ways and means of feeding those bits of information into some sort of an analytical system, and come out with generalizations which can be applied subsequently as a final step in the control of a problem that has been recognized to exist.

You will recognize in this outline what my concept of a research project is -- or a research program. Some parts of such a pattern have been followed thus far in the development of the research program of the Sanitary Engineering Center with respect to the air pollution problem. We found that there had been, as all of you know, extensive examination of local air supplies with reference to particular pollutional sources; and, we found that there had been a great many detailed local studies, using a variety of methods, many of which have not to this day been evaluated with respect to their specificity or their quantitative validity.

In order to get a base line from which to operate, we felt it necessary to start from scratch on a nation-wide basis and get some comparative data within the resources available to us.

This explains why our so-called nation-wide particulate sampling program was initiated and will, I suppose, explain some of the properties of the air pollution program that Mr. Stern will outline to you a bit later.

At the moment, I want to point out that in research we have to go back to all sorts of sources. We are keenly conscious of the fact that much of the problem of air pollution, or rather many of the solutions of the problems that we find, will have to be sought through disciplines over which we, as engineers and sanitarians, have little, if any, control. For this reason, we have been delighted to have the Weather Bureau, the Bureau of Standards, and a number of other Federal agencies join in with the planning and conduct of the research program. In addition, we have to seek information from local sources wherever they exist, attempt to correlate the information, and finally, we have to accept from whatever sources they come in, tips on what the parameters of the problems are. These tips sometimes seem a little absurd. Just by the way of indication of what we do get sometimes, we receive a thing we often can't make use of, but have to file. This letter came from a region in California, which I'll not further identify, and it's signed, "A Friend". It seems that in the Sacramento Union, dated November 28, the writer saw an article in that paper to the effect that, "we are trying to find out something about the toxicity of the air. There's one condition of the air that I'm familiar with that causes a multitude of diseases and that is the bad morals of some of the people who reside in some of the best hotels and other places of abode. A woman when she is sexually excited casts off a pollen-like virus into the air through her brea . This pollen-like virus is exceedingly detrimental to health. I do not know if it could be registered on any kind of an instrument, but if it were possible you would have a tremendous field to work on."

Now all such suggestions have to be culled and out of them certain facts, certain trends, certain leads, do emerge.

What is this air pollution problem? In the first place, we're probably being a little naive in talking about an air pollution problem. We're talking about a component of our environment which is capable of containing anything nature has ever produced or man has ever synthesized. Some of the discussion we've heard this morning indicates the complexity of the atmosphere in terms of the primary contributions to the air, and also in terms of the interactions that occur within it after those primary things are discharged. There are, broadly speaking, two types of problems which require investigation, as we see it. One has been referred to repeatedly this morning. There is a need — there is a requirement for an understanding of the nature of the local problem — the nature of direct emissions to the atmosphere. What are we contributing, and what amounts? These facts are necessary in order to supply the data which the Division of Special Health Services and the medical people wish for an interpretation of their epidemiological studies. They are also necessary to any adequate control program, as most of you are aware. They imply a requirement for instrumentation which can be relied upon, which is usable in the fields, which is not too expensive and which is reasonably quantitative in its results.

Now in addition, something has come up which has been more or less disregarded in the past, but we still hear statements to the effect that air pollution is entirely a local problem and therefore, should not be the concern of either States or regions or the Federal Government. There are coming to light a great many facts, some of which have been mentioned this morning, and one or two others I'd like to bring out, which indicate that our air pollution problem, while it still has major local facets — local phases which require local investigation — nevertheless is becoming a problem of all the people and is a concern of wider and wider regions. The specialized kind of rust of which we represent a part is gradually encroaching on the surface of the earth and occupying the volume of air that we have available to such an extent, that we are now at the stage of producing a measurable impact on that air supply as a total. A few things might be mentioned. Dr. McCabe mentioned the Krakotoa explosion back in the last century, in which a dust cloud generated at one point the southeastern Asian islands produced visible dust throughout the world for a period of two to three years. We've been measuring, as have others, the spread of radioactivity in the atmosphere from single point discharges of fission weapons and fusion weapons. In this case, we have a detectable, easily identifiable, tracer substance which tells us exactly how fast and how far this material travels. The fact is that within a very short time, one can detect these materials in practically all parts of the hemisphere, and we know that far from traveling 60 miles from the direct source as we've indicated this morning, they actually travel the entire distance around the earth, and begin in some measure to permeate the entire available atmosphere over the hemisphere with which we've been concerned. This indicates that we are dealing in fact with pollution of an entire air mass to some degree, and with our increased magnitude of human activity, one can anticipate that this type of pollution will continue. As a matter of fact, I recently saw a series of studies with respect to balance in carbon dioxide consumption and emission, utilizing the best guesses that could be made with respect to those two factors from whatever source. It was concluded that for the past several years — just how far back no one can say of course — there appears to have been a change in the balance in such a way that the amount of carbon dioxide which man is contributing to the atmosphere (man and nature) is larger annually than the amount which is being reconverted by photosynthesis or chemical combinations into non-atmospheric components. Now this means that perhaps our output of carbon dioxide should be examined as a contributor to other changes, perhaps changes in other factors of human life in the long run.

There are certain observations that have been made on the California coast and have developed into what might be described as a modern concept of smog. It has to be recognized at the outset, that the air pollution situation has not yet been determined to be the same in all cities; in fact, it's very unlikely that it will be. In Los Angeles, there has been, on the basis of Dr. Haagen-Smit's classical observations, the development of a concept of smog as related to the interaction between sunlight, hydrocarbons discharged from several types of sources, and traces of NO_2 in the atmosphere. Now it has been the habit, as Dr. McCabe's thesis this morning indicated, for any new observation of that type to be seized upon and used for a period of month's or years by everyone as a unique explanation of all air pollution problems. There is however, beginning to be a feeling that the explanation of the smog situation, even in Los Angeles, may not be entirely explained on the basis of this single reaction, although there is apparently no denying that it does contribute in a major way to the problem. The type of reaction that occurs results in substances which can be measured in terms of eye irritation. Now it has been observed, on a theoretical basis, quite recently, that utilizing gaseous components which are known to exist in the Los Angeles atmosphere in various combinations — there are at least 35 or 40, and perhaps a great many more, reactions of this photochemically activated, or rather photoactivated type, which can result in a wide variety of ozonides, epoxy compounds, aldehydes, organic acids, and the like. And that is without even considering the probability of interaction of these substances in rather unorthodox and theoretically ill-defined ways, due to the intervention of particulate matter which is capable of adsorption providing catalytic surface for the interactions. The upshot of it is that there's beginning to be even now a vague misgiving as to the total explanation of these smog situations in terms of one single reaction. It is rather inconceivable that any one reaction of this sort would be unique in a situation in which we have the possibility of many hundreds of them. In addition to that, there has been an assumption largely, I think, due to the fact that measurements have been confined rather heavily to the Los Angeles Basin, that the ozone or oxidant that was being measured was being produced entirely locally. It can be demonstrated in the laboratories that some of it can be produced through this reaction. Nevertheless, there have come to life recently, observations in such remote points as Fairbanks, Alaska, the Mojave Desert, and other points on the Pacific coast which have indicated that the oxidant content of the atmosphere actually is sometimes almost as high in those areas at certain times, as it is in Los Angeles atmosphere, but without the irritating property. There have also been observations and claims that oxides of nitrogen, particularly NO_2 and NO, have been detected at considerable distances from the site of the local emission.

Now these materials and these observations give rise to some speculation as to whether we aren't missing a bet. Obviously, if we have local emission being dumped into the atmosphere, we have on the one hand materials which are capable of reacting with one another, but they are also capable of reacting with substances that constitute part of the air mass into which they are being dumped, things over which the local community has no control, but which it must understand if it's to interpret the effect of its own emissions properly. One can speculate a great deal about the meaning of these observations; the circulation of the North Pacific high, the subsidence of the troposphere, the fact that materials of the type of ozone free hydroxy radicals and NO_2 and NO are actually produced in the troposphere by photochemical disintegration and degradation of water and other gaseous materials which are present. It makes us wonder if we should not pay a great deal of attention to the composition of the air mass in which our local communities are having to dump their wastes. The total picture involves in the long run, not only an understanding of what we're putting in, but also an understanding of what nature is supplying us to put into. I'm relating these speculations because I think they serve to illustrate well what the rule of the various governmental levels will be in air pollution research. It has already been apparent, in terms of local operations and most State operations, that local agencies can best conduct the actual measurement of their own effluents and the composition of the air to which their citizenry are exposed. On the other hand, in California and in a few other States, there is a program of investigation under **way** which is designed to attempt correlations (Mr. Stead may have more to say about this) between occurrences of so-called smog in different parts of the State to determine whether there is a **simultaniety** or a sequence of events that is common to all of the points which have smog.

There is where the State fits into such a picture. On the other hand, with respect to large scale regional pollutions, of the type which have been discussed in the contribution of exotic gases to the end result, the Federal Government will undoubtedly have to come in because it is a problem well beyond the legal jurisdiction of any single locality or State.

With respect to other prime requirements in air pollution research, as we see them, we need methods for the measurement of the substances over which we require control -- the substances which are producing any effects which Dr. Fisher's Division of Special Health Services can turn up. We need methods -- we need instrumentation which is reasonably automatic to avoid the excessive use of manpower.

As you can see, I have done nothing here except indicate that I think there is a role for the local level, for the State level, and for the Federal level in conduct of any well planned research program in the field of air pollution. Air pollution can no longer be regarded as a strictly localized phenomenon, although it still has major localized aspects. The effective investigation of most of the problems we are going to face in the future will require a close coordination of research at all levels among all of the agencies involved.

Air Pollution Program of the Division of Sanitary Engineering Services

Arthur C. Stern

Since many air pollution control officials are unfamiliar with the make-up of the Department of Health, Education, and Welfare, and of the Public Health Service, advantage will be taken of this opportunity to explain their organizational structures.

The Department of Health, Education, and Welfare is, as you know, the newest of Federal departments. Its principal components are: the Social Security Administration, the Food and Drug Administration, the Office of Vocational Rehabilitation, the Office of Education, and the Public Health Service. Of these, the Public Health Service has the longest history, having been founded in 1789, and having had more than a century of affiliation with the Treasury Department prior to its transfer in 1939 to the Federal Security Agency.

To carry out its mission, the Public Health Service employs about 15,000 full time personnel, representing over 250 occupational specialties and including many health and related professions. Of these, about 2,500 are officers of the Public Health Service Commissioned Corps, and 12,500 are career Civil Service employees. The Commissioned Corps, a long established quasi-military career organization, includes many of the health professional personnel of the Service, such as physicians, dentists, sanitary engineers, nurses, and others. Commissioned officers undertake their careers in the Service early in their professional lives and, like officers in the Armed Forces, are commissioned in rank by the President, with the approval of the Senate. In addition to the active Regular and Reserve Corps components, there is an inactive Reserve Corps of about 1,400 officers who can be called to duty in case of emergency.

As presently organized, the Service consists of four major operating bureaus, all under the direction of the Surgeon General. These are:

1. Office of the Surgeon General: This consists of the Divisions of Public Health Methods, Administrative Services, Personnel, and Finance. In general, it provides the major staff services to the other three operating bureaus.

2. The National Institutes of Health: These comprise a Division of Research Grants, and the following seven National Institutes: Arthritis and Metabolic Diseases, Cancer, Dental Research, Heart, Mental Health, Microbiological, and Neurological Diseases and Blindness.

These institutes are largely grouped around a clinical center in Bethesda, Maryland, and spearhead research on the causes and cures of almost the entire gamut of the diseases of man.

3. The Bureau of Medical Services: Here are grouped the basic medical services on which the Service was first founded. It administers medical care programs in a dozen Federal agencies, such as the United States Coast Guard and the Bureau of Indian Affairs. Its other operations are best described by the names of its six operating divisions, namely: Hospitals, Hospital Facilities, Foreign Quarantine, Dental Resources, Nursing Resources, and Administrative Management.

4. The Bureau of State Services: This is the bureau of greatest concern to those interested in community air pollution, because in it are grouped most of the Public Health Service's air pollution activities.

Under the direction of a Bureau Chief, who is also an Assistant Surgeon General, there are in the Bureau seven divisions, only two of which operate in fields not directly concerned with air pollution. They are the Divisions of Dental Public Health and of International Health.

Two other of the divisions have a somewhat greater interest in the problem, namely, the Division of General Health Services and the Communicable Disease Center. However, it is the remaining three divisions of the Bureau of State Services that will be actively working with States, municipalities, and industry on community air pollution problems. These are the Public Health Service Regional Organization, the Division of Special Health Services, and the Division of Sanitary Engineering Services.

Public Health Service Regional Organization

Since the Public Health Service operates mainly with and through appropriate State agencies, its regional organization provides the means for States and their municipalities to deal directly with Regional Medical Directors and Regional Sanitary Engineers. There are eight such regions in the United States, with headquarters at Atlanta, Chicago, Dallas, Denver, Kansas City, New York, San Francisco, and Washington.

No operation of the Service in a region is undertaken without the participation, cooperation, and knowledge of the Regional Office involved. This does not preclude direct contact between the central program operations in Cincinnati and Washington and our colleagues in the field, and vice versa. Rather, it facilitates these contacts by limiting them to those that are really necessary.

Division of Special Health Services

This division, in general, plans, conducts, promotes, and coordinates comprehensive nation-wide personal health and health maintenance programs for the prevention and control of chronic, heart, occupational, and venereal diseases, and tuberculosis. Its occupational disease prevention program is the present successor to the division responsible for Public Health Bulletin No. 306, entitled "Air Pollution in Donora, Pennsylvania -- Epidemiology of the Unusual Smog Episode of October 1948." Its staff has, over the past several decades, developed much of the basic instrumentation and the analytical and interpretive techniques for assessing the amount and composition of air-borne dusts, gases, and fumes in factories. Many of these methods and devices have been adopted for the study of community air pollution problems.

The future role of the Division of Special Health Services in the Air Pollution Program is to take responsibility for research into the effects of air pollution upon human health. This will involve research in four broad medical areas:

1. The epidemiology of air pollution
2. The physiology and pathology of air pollution
3. The toxicology of air pollution
4. The psychology of air pollution

This research will, we hope, tell us whether we need to intensify our control efforts to avert damage to the Nation's health, or whether what we have been and are doing to control obvious pollution to allow our citizens comfortable enjoyment of their homes, work places, schools, and recreation areas has been good enough to have averted any such unfortunate result.

Division of Sanitary Engineering Services

This division plans, conducts, and coordinates national programs in the field of sanitary engineering, such as milk and food sanitation, water pollution control, radiological health, interstate carrier sanitation, etc. Not long after the dedication of the Robert A. Taft Sanitary Engineering Center in Cincinnati in April 1954, an Air Pollution Program was added to these other national programs, and responsibility was given to the Center to develop and administer the program.

This responsibility has been set forth in detail in the following Service directive, which is quoted verbatim:

> Responsibility for community air pollution operations pertaining to research, technical assistance, training, and demonstrations related to engineering is assigned to the Division of Sanitary Engineering Services. Specifically, this Division will have primary responsibility for research on the sources, extent, behavior, effects (other than health), and control of community air pollution, and for encouraging and collaborating with State, community, and other organizations in related activities. This includes (1) the physical measurement, identification, and tracing of air pollutants; (2) the design, testing, and development of methods and devices for chemical and physical measurements and for studying the complicated interchemical reactions of air pollutants; (3) the development of methods and devices for controlling or preventing the introduction of air pollutants into the atmosphere; and (4) furnishing technical guidance and consultation to States and communities in establishing and operating community air pollution control programs.

In addition to this general responsibility, the Division has a special assignment from the State Department, namely, directing and conducting, for the Technical Advisory Board on Air Pollution of the International Joint Commission, the study of air pollution along the Detroit River. That study is now in its fifth year. The Chairman of the United States Section of the Technical Advisory Board is a Public Health Service officer associated with the Air Pollution Program of the Robert A. Taft Sanitary Engineering Center.

Sanitary Engineering Center

The Sanitary Engineering Center is organized to conduct research and provide technical assistance in the fields of water supply and water pollution, milk and food, radiological health, and air pollution. (Figure 1) Its community air pollution program (Figure 2) is divided into the following operating units:

1. Chemical Research and Development
2. Engineering Research and Development
3. Instrument and Methods Development
4. Meteorology
5. State and Community Services

TENTATIVE ORGANIZATION CHART
ROBERT A. TAFT SANITARY ENGINEERING CENTER

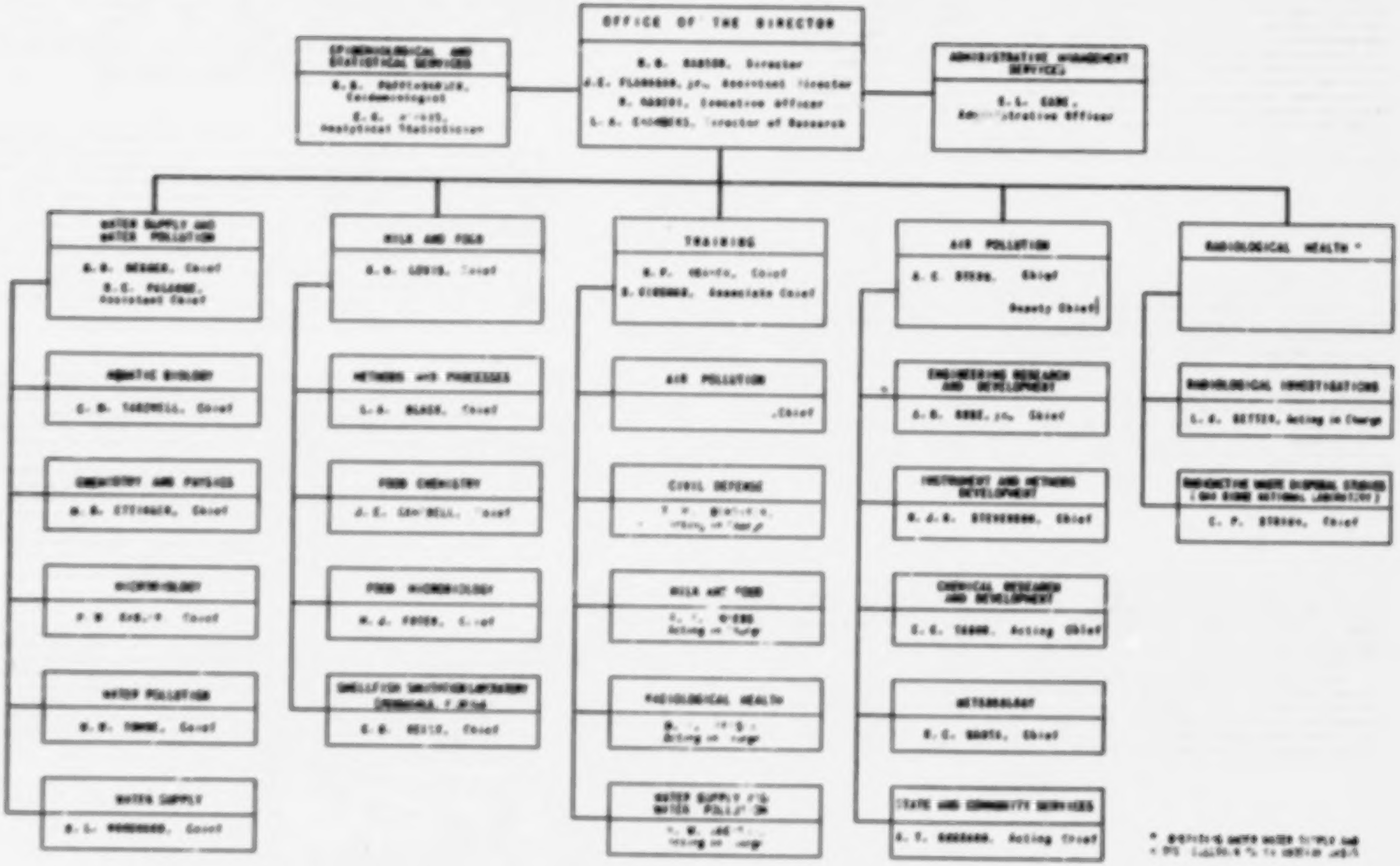
OFFICE OF THE DIRECTOR
Director
Assistant Director
Executive Officer
Director of Research
EPIDEMIOLOGICAL AND STATISTICAL SERVICES
Epidemiologist
Analytical Statistician
ADMINISTRATIVE MANAGEMENT SERVICES
Administrative Officer
WATER SUPPLY AND WATER POLLUTION
Chief
Assistant Chief
AQUATIC BIOLOGY
Chief
CHEMISTRY AND PHYSICS
Chief
MICROBIOLOGY
Chief
WATER POLLUTION
Chief
WATER SUPPLY
Chief
MILK AND FOOD
Chief
METHODS AND PROCESSES
Chief
FOOD CHEMISTRY
Chief
FOOD MICROBIOLOGY
Chief
SHELLFISH SANITATION LABORATORY
Chief
TRAINING
Chief
Associate Chief
AIR POLLUTION
Chief
CIVIL DEFENSE
MILK AND FOOD
Acting in Charge
RADIOLOGICAL HEALTH
Acting in Charge
WATER SUPPLY AND WATER POLLUTION
Acting in Charge
AIR POLLUTION
A. C. STERN, Chief
Deputy Chief
ENGINEERING RESEARCH AND DEVELOPMENT
Chief
INSTRUMENT AND METHODS DEVELOPMENT
Chief
CHEMICAL RESEARCH AND DEVELOPMENT
Acting Chief
METEOROLOGY
Chief
STATE AND COMMUNITY SERVICES
Acting Chief
RADIOLOGICAL HEALTH *
RADIOLOGICAL INVESTIGATIONS
Acting in Charge
RADIOACTIVE WASTE DISPOSAL STUDIES (OAK RIDGE NATIONAL LABORATORY)
Chief

Figure 1

TENTATIVE FUNCTIONAL CHART
ROBERT A. TAFT SANITARY ENGINEERING CENTER
AIR POLLUTION

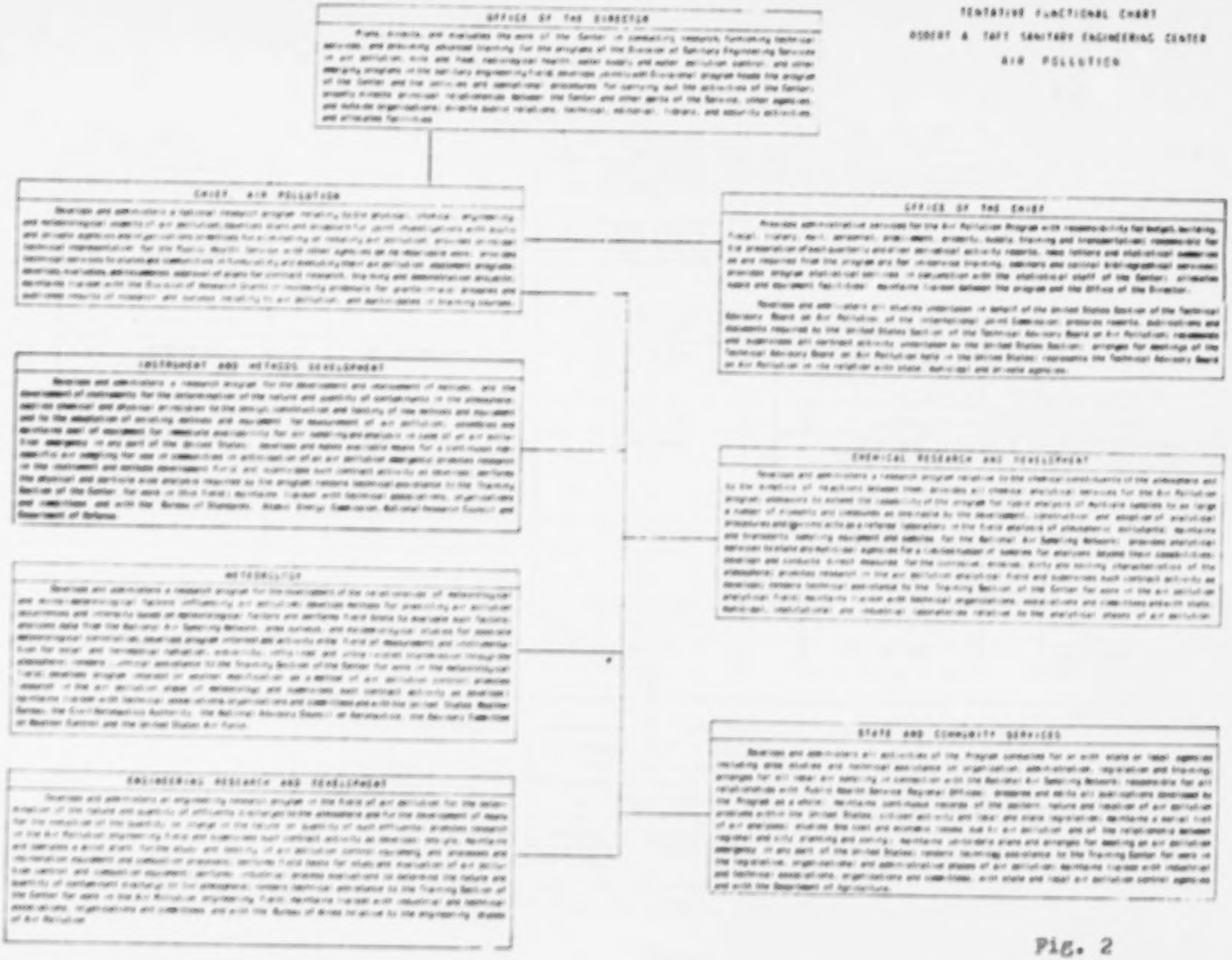
OFFICE OF THE DIRECTOR
CHIEF, AIR POLLUTION
OFFICE OF THE CHIEF
INSTRUMENT AND METHODS DEVELOPMENT
CHEMICAL RESEARCH AND DEVELOPMENT
METEOROLOGY
ENGINEERING RESEARCH AND DEVELOPMENT
STATE AND COMMUNITY SERVICES

Fig. 2

Chemical Research and Development

The principal research activity of this group is the National Air Sampling Network, now in its second year. This involves the collection of air samples from all parts of the United States on a routine basis and their shipment to the Center at Cincinnati for chemical analysis. This effort is, for the first time, giving a unified picture of the general pollution levels of the nation, and will prove a potent tool when correlated with the epidemiology of air pollution under study by the medical section of our program.

Engineering Research and Development

The Engineering Research group of the Air Pollution Program of the Public Health Service has as its general area of activity the determination of the nature and quantity of effluents discharged to the atmosphere, and the development of means for the reduction of the quantity or change in the nature and quantity of such effluents. In connection with this responsibility, it is developing a pilot plant and testing facility at the Center. Specific projects being undertaken this year are: An experimental study of the factors affecting the design and performance of fabric filters of the type known in industry as bag houses, dust arresters, or cloth dust collectors; an experimental study of some incinerator design factors; field studies of effluents from the cotton ginning industry and their control; and an evaluation of the various forms of micro-Ringelmann charts for measuring smoke density. In addition, this group has assigned one man full time to work with the State of California and the Los Angeles County Air Pollution Control District to assist them in their study of petroleum refinery effluents.

Instrument and Methods Development

No fields of air pollution research need more new approaches than the development of automatic instrumentation for 24-hour-a-day monitoring and surveillance of the atmosphere and the study of the exact nature of the atmospheric contaminant. One of the most exciting areas of investigation is the influence of exotic pollution on smog formation over urban areas. We feel now that we must look beyond the pollution produced by the afflicted city to the contaminant coming in with the supposedly "clean air" from the countryside, the sea, or the lakes. There are many indications that the interaction between local and foreign contaminants may, for many communities, spell smog. All these areas are now under study by this group.

Meteorology

The Weather Bureau team at the Sanitary Engineering Center has for its current projects studies in each of the following project areas: Definition and prediction of smog episodes; relationships between meteorological variables and air pollution levels; trajectories and air mass modifications; feasibility study of modeling atmospheric transport and diffusion; and development of a mobile meteorological unit and of a fixed station for the Center. In addition, by tying in the meteorological group with the several field studies under way, a new approach to air pollution sampling is being developed in which predictive meteorological data in large measure determines the kind of air sampling to be undertaken.

State and Community Services

Technical assistance to States and local communities is the primary function of our State and Community Services unit.

(Figure 3)

U. S. PUBLIC HEALTH SERVICE

Community Air Pollution Program
Budget for Fiscal Year 1956

(July 1, 1955 -- June 30, 1956)

Research Grants		$500,000
Research Contracts		
Medical --	$200,000	
Non-Medical --	50,000	
Total --		250,000
Research in other Federal Agencies		
Weather Bureau --	$200,000	
Bureau of Mines --	100,000	
Bureau of Standards --	100,000	
Total --		400,000
Training		40,000
Direct Operations		
Medical --	$160,000	
Non-Medical --	434,000	
Total --		594,000
Grand Total		$1,784,000

There has been some public misunderstanding as to the availability of funds as the result of the passage of Public Law 159, 84th Congress. Although this law authorized the appropriation of not more than five million dollars a year for five years, the actual appropriation for this fiscal year -- the first one under the law -- is one and three quarter million dollars. (Figure 3) The law includes no authorization for formula grant-in-aid appropriations for air pollution purposes. However, it does authorize grants for research, training, and demonstration projects.

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What we can do this year is to work out specific projects where there can be Federal-State-Local cooperation. We have negotiated with several States and communities for such projects. We have reached agreements with the State of California and Los Angeles County to provide three people to work in the State, two of whom will work with the County. The State is matching that personnel, man to man, and in the two Los Angeles County projects, the understanding is that the County will assign about six men each to the projects to which the Federal and State people are assigned. Thus, the total Public Health Service participation in these California projects is of the order of 20 percent. A similar project has been negotiated with the State of Kentucky, Jefferson County, and the City of Louisville. In this project, the participation of the Federal establishment is approximately 50 percent of the total project; the State, county, and city providing the remaining 50 percent. The participation of the Public Health Service itself is again about 20 percent of the total project, which has a dollar value of around $140,000. Similar discussions are under way in one or two other areas of the United States; all directed to this same type of project arrangement, whereby the principal backing of the project is local with the Public Health Service participation of the order of 20 percent, although the total Federal participation (i.e. including Weather Bureau, Bureau of Mines and Bureau of Standards contribution) may range anywhere from 30-50 percent.

We have just about reached the end of our fiscal ability to take on more long-term cooperative projects this year. However, States and communities should feel free to call on the facilities of the Center for short-term technical assistance, either in the field or in the laboratory. No formal negotiation is needed to obtain such help. The preferred channel for requesting short-term technical assistance is for the local government air pollution control agency to request the specific aid sought through the State air pollution control agency (which means the State Health Department, unless some other single State agency is charged with air pollution abatement responsibility). The State agency should in turn forward local requests, or transmit its own requests for technical assistance, to the Public Health Service Regional Office, who, in its turn, will transmit them to the Community Air Pollution Program at the Sanitary Engineering Center. This procedure will amplify the aid available to States by adding Regional Office resources to those of the Center, and will further amplify aid to local communities by adding the resources of the State air pollution control agency.

The other functions of our State and Community Services unit include the preparation and distribution of directories, news-letters, informational studies, manuals, and bulletins in areas helpful to local and State administrative agencies, and to the public.

Research Grants and Research Contracts

In setting up its air pollution research program, the Public Health Service has taken the view that the principal research resource of the Nation lies in its universities, research institutes, and in the research establishments of American industry. In order to make maximum utilization of this tremendous research potential, two mechanisms are being employed: research grants and research contracts. Although both these mechanisms are aimed at tapping the same group of non-Federal researchers and research facilities, they do so by different means.

The research grant seeks to elicit the research ideas of these researchers and to provide funds to let them undertake studies and experimental work based upon their own ideas. Since such ideas arise from all parts of the country and from persons of diverse professional skills and backgrounds, this approach has the major virtue of freeing the investigative process from the strait jacket of the limited concept of any single individual or small guiding group.

However, the very spontaneity and diversity of such ideas would tend to give a shotgun pattern to the resultant research. Certain areas of interest to individual researchers will by this mechanism be intensively investigated at the same time that other areas go untouched. To fill in the gaps, it is necessary to have a means by which some coordinating agency, in this case the Public Health Service, can contract with this same group of researchers for projects conceived by the Service as necessary for an integrated approach to the air pollution problem. This is the research contract.

Application for Research Grant

Since many of you may be potential applicants for research grants and potential recipients of research contracts, a more detailed exposition of these is in order. Specifically, there is available a lump sum earmarked for air pollution research grants. In the present fiscal year, it is a half million dollars. Those who wish some of this money for support of their own research effort must make application on forms available for the purpose from any regional office of the Service, from the Sanitary Engineering Center in Cincinnati, from the Service headquarters in Washington, or from the Division of Research Grants, National Institutes of Health, Bethesda, Maryland. As would be expected, the applicant must describe the proposed research, its objectives, the means to be employed in trying to reach the objective, the equipment and facilities available to the researcher, the new equipment or facilities that would have to be acquired with research grant funds, the personnel proposed, their qualifications, and last, but most important of all, the qualifications of the applicant or principal researcher, who must be one and the same person.

Use of Research Grant Funds

Research grant funds may be used to pay the salary of the principal investigator and the salaries of those who work on the project under his supervision, provided all or part of the salaries of professional personnel be paid from research grant funds only to the extent that they have previously been paid from other than regular institution funds. Since there is a limit of 15 percent overhead, it is appropriate in a research grant application, that the institution sponsoring the research underwrite some of the cost of the study, at least to the extent of the remainder of the overhead costs. Actually the applicant institution may choose to carry a larger share of the project costs, or may solicit for funds from sources other than the Public Health Service research grants program for sharing the costs of the project. Although the grant is made to one or several designated principal researchers, they must be sponsored by an institution which on the application must indicate its willingness to accept responsibility for the study and for the administration of the grant funds. Should the principal researcher change institutions, the research grant does not automatically move with him, nor can the sponsoring institution automatically apply research grant funds to support someone other than the designated principal researcher. Such changes can be made only after specific Public Health Service approval.

Approval of Research Grants

Upon receipt by the Public Health Service, a research grant application is referred to a study section made up of eminent engineers, scientists, and physicians, most of whom are non-Federal employees, who recommend approval, disapproval, or deferment of the application on its merits, or ask to have it resubmitted after revision or amendment, and who finally give approved applications a priority rating. The applications from all study sections, after review by the National Advisory Health Council, and approval by the Surgeon General, are then supported to the extent of the availability of funds. For instance, if there are a million dollars worth of accepted applications and only a half million dollars of available funds, the half million dollars worth having the highest priority will receive support. The remaining projects that do not receive funds, may subsequently receive support if and when additional money becomes available in the same or a subsequent fiscal year, provided new applications of higher priority sufficient to use up available funds are not approved in the interim.

Research Contracts

Since the form of research contracts (as distinguished from research grants) is, at the time of writing, still under study, no such contracts have as yet been let. There is, however, an appropriation this year for a quarter of a million dollars for such contracts, and they will be nogotiated during the next several months. Since both reasonable overhead and profit can be allowed in such contracts, they can be let to both profit-making research organizations and self-sustaining non-profit research institutes. It is anticipated that the size of individual contracts will be in the same range as has been indicated for research grants. There is nothing in the enabling legislation to prevent a municipality or a State from acting as sponsor for a research grant or of accepting a research contract. This fiscal year, 80 percent of the contract appropriation will be used for studies sponsored by the Division of Special Health Services; 20 percent for those negotiated by the Division of Sanitary Engineering Services.

Other Federal Research

In addition to fostering research in non-Federal establishments, the various agencies themselves are undertaking a substantial air pollution research effort, a large part of which is being conducted by Federal agencies other than the Public Health Service, using funds appropriated by Congress to the Service. Specifically, $400,000 worth of research is being provided this year by the Weather Bureau and the Bureau of Standards of the Department of Commerce, and by the Bureau of Mines of the Department of Interior, using Public Health Service funds made available to these agencies through the Division of Sanitary Engineering Services.

The Weather Bureau has accepted the largest of these interagency commitments, and has among other things, established a field station at the Sanitary Engineering Center in Cincinnati. Weather Bureau and Public Health Service personnel are now working there side by side in a research effort to explore more fully the relationships between meteorology and air pollution, and will soon be working side by side in field studies in several parts of the United States.

The Bureau of Mines has accepted research studies on the composition of automobile exhaust, the design of incinerators, and the removal of SO_2 from stack gases; it will make available for these studies some of the best research facilities and personnel in these fields in the Nation.

The Bureau of Standards' special area of interest is the development of methods and instruments for analyses of gases and vapors in the atmosphere. This is being done both at the Bureau's central research establishment in Washington and in the field. The areas chosen for field studies include Los Angeles, Louisville, and other cities having atmospheric contaminants of an extremely complex nature.

Conclusion

It is hoped that this discussion will have given you a clearer picture of the Division of Sanitary Engineering Services' Community Air Pollution Program for the current fiscal year. We would appreciate your comments and advice on how to improve it over the next several years.

LOCAL AIR POLLUTION CONTROL PROBLEMS

Tuesday, September 20, 1955 - Afternoon Session

Harry C. Ballman, Chairman

BALLMAN: This morning it was brought out that there would seem to be a place for the local effort, the State effort, and the Federal effort in air pollution control activities. This afternoon we will discuss control activities at the local governmental level. Since so much has been said about the Los Angeles situation, may I point out that we have two considerations, first, the problem in Los Angeles County and, second, the problem in the rest of the United States. Occasionally we are prone to carry the West Coast problem across the 48 states, and in some instances, particularly in our present state of knowledge, cause undue harrassment to certain areas by attempting to impose restrictive standards. These standards may have been determined for an area with highly critical conditions, and are in some instances imposed on areas with much less critical conditions.

This morning you heard statements about areas requiring research and investigation in which the Federal Government intends to help. This is good. This afternoon I think we're quite fortunate in having discussions in an area where we do have (as Dr. Louis McCabe mentioned) experience since 1861 - in administration of some programs of cities in this country. The bulk of these programs as has been indicated were smoke control programs. We are now moving out into the larger area of general air pollution in which smoke is only one of many pollutants.

The members of your panel this afternoon are men who have had many, many years of experience in administering air pollution and smoke control programs. I would estimate that the four men who are going to speak to you have jointly 60 to possibly 80 years'experience. That's a sizeable experience factor in this new activity of air pollution control.

Our first speaker is Dr. Leonard Greenburg, Commissioner of Air Pollution Control, City of New York, who has had many years of experience in industrial hygiene and in air pollution control.

Problems In Official Municipal Air Pollution Control Enforcement

Leonard Greenburg, M. D.

There is great need for concerted action on the part of our Government in a nation-wide program of air pollution control. This obviously should have as its objective the preservation of the purity of the atmosphere of our land so that the health and comfort of the citizens will not suffer. Several branches of the Federal Government have already made important contributions in this field. Now we can look forward to the development of an amply supported, unified, program under the leadership of the U. S. Public Health Service which for all time should assure the people of this vast country the benefits of clean unpolluted air.

This afternoon, I would like to discuss certain problems in municipal enforcement which appear to have an important bearing on work of the local official air pollution control agency. I shall not attempt, by any means, to discuss all of the problems which may arise in the administration of such an agency. To attempt to do so would take more time than is now available, and moreover, would not greatly alter the lesson to be learned from this discussion - if indeed, there is a lesson which this presentation can teach.

The legal authority under which the air pollution control officer acts comes basically from two sources, first, a State or city enabling statute or law and, second, a set of rules or regulations which presumedly have been drafted under the authority and in accord with the enabling statutes. Finally, it is to be noted from this point onward, the control officer acts in his own best interpretation of his authority to deal with day to day problems.

The task before the control official is dictated in such a large measure by the provisions of the enabling act that one cannot discuss the problem before us at this time without at least reference to one or two provisions of the enabling act. It is this latter legal document which dictates an answer to the question as to whom is to make the rules and regulations of the department, that is, who has the rule making power. In the County of Los Angeles this power is vested in the county board of supervisors, a group of men who have been elected to office, elected public officials whose chief duties are very remote from the field of air pollution control, and who, because of the very nature of their election, and without any reflection whatsoever on their integrity, are naturally subject to political pressure and the activities of various pressure groups in the community. It may very well be that this type of legal provision may place the enforcement officer in a position wherein he cannot obtain the rules and regulations from the legally constituted rule making body which will enable him to achieve the ultimate goal of control, the whole subject of the composition, appointment, and tenure of the rule making board should receive careful study.

The official agency should expect certain types of violations to be remedied immediately: the type of violation due to the poor maintenance or poor operation of equipment which results in, let us say, the production of dense smoke falling within the terms of the act. But there are certain types of violations which can only be remedied by new construction or reconstruction of equipment which may require a long period of time for its completion; often this is referred to as a variation or the setting of a timetable. Who is legally endowed to grant such variations? Should these variations be granted by the director or the commissioner of the official agency, by the rule making board, or by a special legally constituted board designed only for the purpose of hearing the facts in each individual case and then making a decision which is binding on the official agency? It is easy to see that a completely independent board may be advantageous from certain points of view, but such a board may also impose a burden on the official, and hamper its effectiveness. It is, in fact, conceivable that some boards might well show the progress of the program as a whole - it would, in general, do the director little good to attempt to place the blame for lack of progress on the shoulders of such a board.

Let us turn our attention now to a consideration of the rules and regulations which spell out the authority of the department. Should these rules prescribe in great detail what may or may not be done by an installer of new equipment, as is the case in some jurisdictions, or should the rules only specify in a broad way what is to be accomplished, and leave many details to the installer and to the judgment of the official agency, without any specific limitations actually set in the rules which have such formal legal origin?

In discussing this very point, some people contend that the official agency should not set any detailed specifications on equipment but should only limit itself to objectives. They say, for example, if the installation makes smoke, then the installer is guilty and, at this point, the department should go into action for correction. Other workers in the field take the position that details of equipment and controls should be specified so that the new installation will not, as a rule, become an offender.

The first approach, obviously, is one that rests on punitive action by the agency. The second is based on the fact that the official agency is primarily interested in prevention - just as is the official health agency in the case of, let us say for example, cross connections in the water supply system of a building, or in the design and construction of equipment for the pasteurization of milk. Certainly, this is an aspect concerning the design of rules and regulations which should be studied carefully by an informed group, so that local communities may have the benefit of the most informed thinking when they set out to design their rules for air pollution control.

In the rules of some communities in this country, certain standards are set forth for the use of permissible fuels. In fact, several American cities largely owe their great progress in air pollution control to the enforcement of this one regulation. There is no doubt that such a rule is of real value. But does a rule making board have the power to regulate the fuel used in the community? A study of enabling laws and statutes often fails to reveal that this power has been conferred on the rule making board. Here again, we need careful study of enabling statutes and laws in order to make it possible for the official agency to achieve its objectives.

The standards of emission, prohibited by the rules of the agency, often constitute the background of a serious problem in enforcement. In most jurisdictions, the Ringelmann Chart is prescribed as a measure of smoke density and, in some cases, this measure is fairly satisfactory. But it is necessary to read the Ringelmann Chart from a distance of 40 to 50 feet in order that the alternate black and white squares may be fused visually so as to form graduated gray to black areas. To read the Ringelmann at a distance of 40 to 50 feet is impossible in very many built up cities. Certain jurisdictions, in order to avoid this difficulty, maintain that their inspectors are so trained that they use the Ringelmann grading system without actually making a comparison with the test chart in the field. Legally, this leaves the department open to well founded criticism, and surely a clever lawyer might well upset the department's program by a carefully prepared attack in this procedure.

In an effort to avoid complications, such as those mentioned previously, some jurisdictions have adopted a type of Ringelmann Chart photographically reduced so that visual fusion of the alternate white and black squares can be obtained by holding the chart at arms length, and other air pollution control departments employ a printed impression of a photoengravers scale which has been standardized against a Ringelmann Chart. Both of these are reasonably satisfactory, but they both tend to overestimate the pollution from large stacks, since the greater depth of the smoke column will be interpreted as a higher reading as compared with ordinary small stacks.

The Ringelmann and charts similar to it are open to more serious criticism when they are used in an attempt to judge white or yellow-white smoke.' Here, one encounters the possibility of bringing a case to court as an apparent violation, which turns out to be largely a discharge of steam or water vapor. The control official will be wise if he has stack sampling done before the service of legal papers in such cases. But there remains a serious deficiency in the use of the Ringelmann Chart, or its substitutes; in the case of yellow-white smoke, we need some other approach to this portion of our problem.

Speaking of standards for determining violations, it is interesting to turn to the problem of the measurement of emission from automobiles, trucks, and buses. I have been told that in Los Angeles County, the printed chart used for stack observations is similarly used for automobile trucks. This is not possible in a city such as New York, and probably, would not be possible in many other cities. At the last public hearing which we held in New York City, we proposed a rule based on a yardstick of the motor vehicle emitting smoke continuously for a given number of yards (say 100) while traveling along the highway. This we believe might work out satisfactorily, and still be objective enough to suit the courts.

The enforcement authorities are in great need of correct and satisfactory values for permissible levels of discharge of pollutants. There are very few standards available today, and these may be open to question. How much of a pollutant should, let us say, a factory be permitted to discharge? Shall it be measured in terms of concentration per cubic foot of the gas in which it is carried, or shall it be measured in terms of total weight of pollutant in a given time, or shall it be determined on the level to which the use of an acceptable, well designed, cleaning device will reduce the pollutant before discharge (old Massachusetts provision in factories)? There is room here for serious consideration of this problem, for in municipal enforcement, this may be an impediment in the way of success of the program.

In the field of air pollution control, there is great need for experimentation, and it may, and often does, happen that time consuming experimental works are necessary when the department is actually confronted with the solution of a complaint problem. Study of rules and regulations now in force often fails to reveal legal provisions which make this possible. Attention should be given to this aspect of municipal enforcement.

Finally, it might be well to call your attention to the fact that most, if not all, municipal regulations make it a violation to exceed a certain Ringelmann number for a certain time period. Legally, this imposes a strict and fixed duty on the enforcement official. If the enforcement official does not take action, he may be guilty of non-enforcement of the law. This point, although a minor one, may be quite embarrassing. In the present state of air pollution control, anything which can legally be done to fortify the position of the enforcement officer should be done.

I have presented this brief review of but a few of the problems in official municipal enforcement, merely to make it clear that we have a task before us - the task of organizing municipal enforcement on a sounder basis than it is today.

In the year 1920, the administration of local health departments throughout the United States was in very much the same position and condition as is our problem in the field of air pollution control today.

At that time, the committee on administrative practice of the American Public Health Association was formed. This committee formulated five major objectives as its chief function. These have been summarized by Dr. W. L. Halverson, as follows:

1. Secure authentic information as to the actual practice of American communities in the field of health organizations.
2. Utilize the information in the form of a typical community health program which might be set up as a norm, or as a general guide, to be used by any community which aspires to provide adequate health protection for its citizens.
3. Devise a method by which the health officer may appraise the results obtained by his program.
4. Make results of surveys, standards of administrative practice, and appraisal procedures directly available to health officers.
5. Secure popular support for public health programs by using the appraisal scheme to arouse local interest in health achievement.

I cite these objectives, for I believe that they may be used not as a close working model, but as a guide to parallel objectives in the field of air pollution control.

In closing, I would like to urge that a committee be organized, under suitable technical sponsorship, to study the questions of State and municipal enforcement, and in this manner, bring about more efficient departments of air pollution control, the objective which brings us to this meeting today.

CAMERON: Much has been made of wording ordinances and regulations to make them easier for officials to enforce. We, in public health, are often faced with the establishment of proper appeal procedures for the person against whom the official agency is taking action. Some people have expressed the feeling that it should be up to the discretion of the public official to make decisions concerning action to be taken against the violator. After the official has made this decision, the person affected may regard it as an adverse decision, and feel that he has the right to appeal to some body or official. When this request is made, what type of official body or group should he appeal to? Obviously, he cannot make another appeal to the official who made the decision. In my opinion, the regulations should include the establishment of a proper appellate board.

GREENBURG: Well, in the first place, I wish to make it clear that I don't completely favor the department or official agencies having the jurisdiction of making the timetable or the variation. I say, that's what we happen to do in New York, but I don't mean to suggest that's the only way to do it. I think that any timetable that's been imposed has got to be imposed on an objective basis. You've got to be able to demonstrate to the company that they are doing something they shouldn't be doing, and that they must change. Now if they do not agree on the timetable, it seems to me they should have some body to appeal to. I think that is only fair. This might be a court, but I think there's a great danger in the other scheme, you see, where you relegate the timetable to an isolated body. They may not be particularly interested in the department getting a job done. They may be interested in keeping themselves in the clear. I believe that this problem arose in Los Angeles. For the variation board, or whatever they call it, was accused of hampering the rapidity of the program. I must confess, I don't know the answer to all of these questions; they need further deliberation and study. But I do agree with you, that there should be some recourse if the timetable is set that an industrial company objects to and says they can't meet. In our experience, we have not had too much trouble on that score when we approach the question on an objective basis of what is taking place.

BAILMAN: If I may add to that answer, Dr. Greenburg; anyone in these United States who feels that he has been wronged by an officer or a board of the city, always has the right of appeal to a court and a trial (before a jury, if he desires it). That is just the American way of doing business. If the lower court doesn't satisfy him, he has the right to appeal to a higher court. He may appeal until such time that he is proven in violation of a law beyond a reasonable doubt and through due process of law. Regardless of what boards or bodies you set up, you still have the legal procedures, which are the inherent right of every American citizen.

Dr. Greenburg, you have keynoted the areas we are going to cover this afternoon, and have posed some questions which we hope our remaining four speakers will be able to answer. The next speaker, Mr. Charles W. Gruber, is the Chief Smoke Inspector, City of Cincinnati; he has been on the job for many years and he does have some of the answers.

Typical Air Pollution Ordinance Provisions

Charles W. Gruber

As an introduction to this paper setting down a compilation of typical ordinance provisions, a brief statement of the constitution of the various kinds of legal authority will be made.

Local Jurisdictions

Up to the present time the authority to control air pollution is found mainly in the municipality, the county, and a group of counties. The interstate compact is being fostered, but none exists at present. By far, the most common jurisdiction found is the municipality, but with the growth of metropolitan areas, the air pollution district encompassing a county-wide area is finding favor. Several such districts are found in California, Los Angeles County District being the most widely publicized, in Harris County, Texas; Milwaukee County, Wisconsin; Allegheny County, Pennsylvania; Jefferson County, Kentucky; and others. If a count were taken, these units would not probably number more than a dozen. A new concept of a metropolitan district formed by a core city and twelve neighboring communities has been successfully formed by the Canadian city of Toronto and its environs. This unit will enter the field of air pollution control beginning January 1, 1956.

The "ideal" jurisdiction will vary in each locale depending on the presence of technical influences and the political situation. In other words, it does not follow categorically that the municipality, the county, or the metropolitan district or group of counties, is the best. Each area must be studied and conclusions drawn to arrive at the best practical attainable solution.

Legal Status*

(1) Common Law: Under the common law, smoke and fumes are considered to be a nuisance when produced in such quantities as to interfere with the comfortable enjoyment of life and property.

(2) State Law: The States, under their general police power, can also declare air pollution to be a nuisance and pass legislation regulating the emission of contaminants into the air, thus covering situations that would not, under the common law, be considered a nuisance.

(3) Local Law: The extent to which local governments possess a power similar to the state to declare air pollution a nuisance depends on State constitutional and statutory provisions, or upon the charter of the local unit.

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* Air Pollution Control, Bureau of Public Administration, University of California, Berkeley, California, Volume 13, Number 3, January 1955.

Local law takes the form of the Home Rule Cities, such as certain cities in Ohio which are authorized by the Charter of the State to adopt local regulations which are not in conflict with State law without specific enabling legislation by the State body. Other local jurisdictions may be restricted to doing just those things which enabling State legislation permits them to do.

Kinds of Governmental Action

(1) Control may be effected under common law and general statutory provisions for abatement of public nuisance.

(a) Without any specific mention of air pollution or smoke.

(b) With mention of air pollution or smoke, but without setting any standards or definitions.

(2) Specific air pollution local control ordinance with no provision for enforcement by qualified personnel in the air pollution abatement field.

(3) The establishment of a comprehensive air pollution control program.

(a) Adequate control ordinance plus adequate air pollution control staff.

Form of Air Pollution Control Programs

(1) Detailed ordinance equals all specifications contained in the ordinance.

(2) Specific emission limits in ordinance with an Air Pollution Control Board having broad powers to make rules and regulations to accomplish objective.

(3) Board have broad powers to establish emission limits as well as other specifications.

Typical Ordinance Provisions

We have now progressed to the point of putting together in summary form the various provisions found in Air Pollution Control ordinances in force in many localities. To my knowledge, no one ordinance incorporates all of the following provisions. A Statistical Tabulation of Ordinance Provisions of United States and Canada is available from the Air Pollution Control Association, 4400 Fifth Avenue, Pittsburgh, Pennsylvania, and will be helpful to anyone faced with the task of drafting legislation.

(1) Opening statement - enacting the ordinance: The opening statement usually sets forth the purpose of the law or the reason for its enactment. It is commonly preceded by a "whereas".

(2) Definitions: Definitions are important. A good source of definitions can be found in the American Society of Mechanical Engineers model ordinance, or the American Society for Testing Materials Committee D22 on Air Pollution.

(3) Regulatory Board, Advisory Board, Appeal Board, or Hearing Board: The provisions for a Board are written to grant power to adopt rules and regulations, to advise the air pollution control official, to hear appeals from decisions of the head of the regulatory official, or to grant variances. The powers of the Board so constituted should be defined in the law in rather concise terms. A Board may be vested with the power to grant temporary variances of the ordinance, and when such power is used with care, it can be of material assistance in disposing of the more complicated cases wherein time is required to find the technical solution to air pollution problems.

(4) Authority to Establish Rules and Regulations: This authority is found in many ordinances to permit the orderly development of control or inspection procedures to accomplish the broad objectives of the law.

(5) Permit and Operating Certificates, Equipment Standards, and Fuel Specifications will be treated by other speakers at this conference.

(6) Reporting of Sales: This specification requires that the sale of each item of equipment, regulated by the ordinance, be reported to the enforcing authority. Purpose of this provision is to aid in enforcing the permit regulations of the ordinance.

(7) Annual Inspection: Provides for an inspection, once a year or less frequent, of combustion equipment at times including all fuels, coal, oil, and gas(in some cases gas equipment is excepted) for the purpose of seeing that such equipment is maintained and kept in good state of repair, so that pollution from the operation of said equipment is held to a minimum.

(8) Schedule of Fees is established for the issuing of permits for operating certificates, and the charges made for annual inspections.

(9) Standards of Emissions:

(a) Visible Smoke: Common to all ordinances is a description of dense smoke, and the declaration that such smoke is a nuisance, and the escape of such dense smoke into the atmosphere is therefore unlawful. A number of different standards are used, with the Ringelmann Chart being the most common. Other instruments or devices used are the Micro-Ringelmann Chart, the Smoke Scope, and the Umbrascope. The Smoke Scope is a new instrument produced by the Mine Safety Appliance Company to afford a direct comparison between the visible smoke emission and two shades of gray approximating No. 2 and 3 on the Ringelmann Chart. The U. S. Bureau of Mines' Report of Investigation 5162, September 1955, reports on the comparison of the Smoke Scope and the Ringelmann Chart. The Umbrascope is a rather old instrument containing four gray glasses and was used for direct comparison between the visible smoke emission and the four glasses.

(b) Fly Ash from Combustion Processes: The most commonly used criteria emission for fly ash is the American Society of Mechanical Engineers standards of .85#/1000# gases adjusted to 12 percent CO_2. Not over 15 percent of total entering dust separating equipment shall be emitted from the stack. St. Louis Law has tightened specifications on smaller sized solids. New York uses an emission limit stated as pounds of dust per 1000# steam generated.

(c) Other Air Pollution Emissions: California air pollution has utilized a unique approach to the regulation of visible emissions which are not black or shades of gray. This is accomplished by language in the law which makes it unlawful to emit any visible emission of an air pollutant which has an opacity equivalent to that of black smoke violation of the law.

Los Angeles County has adopted regulations limiting the emissions of solid particulate matter according to the weight of material processed.

(d) Exceptions to the Above: In general, ordinances provide exceptions for certain boiler or furnace operation, namely, the fire building or fire cleaning. In some cases, a single exception is made for all purposes. In one community, every industry is treated separately, and exceptions are made according to the needs of the industry.

(10) Special Provisions: A unique provision of the Allegheny County, Pennsylvania, is that it requires compulsory research programs with certain industries and the annual reporting of progress to the enforcement official.

An unusual requirement found in California State Law, is that it becomes an unlawful act to fail to furnish information concerning the discharge of air pollutants when request is made for such information by the legally constituted control agency. Jefferson County, Kentucky has a similar provision.

(11) **Enforcement:** The usual provisions for enforcement provisions are prosecutions for criminal acts and misdemeanors, and providing for fines for violations of the law. Many ordinances, in addition to prosecution and fines, provide for the sealing of equipment to prevent its use when such use results in violation of the ordinance.

(12) Ordinances many times contain the right of entry into premises for the purpose of enforcing the ordinance.

In summarizing this paper, it is stated that local ordinances should be drawn only after a study of the air pollution situation which prevails, and a determination of what is to be accomplished by such action. Remember, an ordinance alone will not clean up air pollution. It takes the team of ordinance plus enforcement action. The experiences of other communities, with like problems, can be very helpful in the preparation of air pollution ordinances, but it is an extremely risky proposition to utilize a neighbor's ordinance just because it worked so well for him.

COUCHMAN: I agree with Mr. Gruber, that most ordinances have something in them on fly ash concentration or dust loading limits. I often wonder how many official agencies make such determinations. Seldom does an official agency have the technical personnel to do it, and in addition to that, the making of such determinations is open to question. Even at the present time, there is no acceptable procedure establishing the manner in which the results should be obtained.

GRUBER: You will find more and more the demand that air pollution control agencies be set up to do a job of stack sampling, difficult as it is. Emission limits must be checked and stack sampling is the only way this can be done. The methods of stack sampling are becoming better known and more reliable every day.

KOSCIUCH: In reference to Mr. Gruber's annual inspection, we make about 42,000 annual inspections each year in the city of Chicago, and that's on fuel burning equipment and incinerators that serve 6 flat buildings and over. Every year our men leave about 7,000 repair notices to the owners to fix their equipment. We feel that that is a preventive service to these owners because we find out the owners kind of rely on us to tell them when their equipment needs fixing. They won't go down and look to see whether it needs fixing.

GRUBER: I think that our history on annual inspections somewhat bears that out.

BALLMAN: For those of you who are anticipating air pollution control administration or legislation, let me point out that although your ordinance or your legislation may tell you that you have the right of entry onto a man's property, be very careful how you use this authority. You have no right of entry unless you have a warrant in your pocket.

This brings up a second point why we are so concerned about telescopic readings at a distance from the plant. If a man knows that he is violating, and he knows that you are going on his property to get evidence against him, he may wish to object to this procedure and refuse entry. He has every right to keep you off his property, unless you get a warrant. A warrant necessitates evidence showing a possible violation. This may become impractical. Therefore, we require instrumentation that enables one to seek violations while off of a man's property. I hope the Public Health Service may be interested to help develop equipment that can tell us the story as to a source of pollutant at some distance from the source.

GRUBER: I was asked to present typical ordinance provisions and that is a typical ordinance provision.

BALLMAN: I'm in an unusual position in this next introduction. The next speaker is in a sense, my boss. As we all do on radio and television programs, may I advertise my sponsor. Mr. H. Kenneth Kugel is President of the Air Pollution Control Association, and he is a man with a great wealth of experience and information, particularly in smoke control and air pollution control work in the District of Columbia.

Equipment Standards

H. Kenneth Kugel

There are two theories in the thinking in regard to requirements for the selection and installation of fuel burning equipment as it relates to control of air pollution. One is that it is only necessary to lay down standards for performance, and all pollution will be thereby kept within necessary limits. The other is that it is necessary to control the type of equipment that may be permitted to be installed and the work of installation. I believe in the latter theory with some reaching into the first for certain things such as boiler ratings, American Society of Mechanical Engineers Code construction, etc.

Those advocating the performance specifications maintain that if the equipment does not violate the legal limitations, what more can you desire? Nothing more, but human nature being what it is, there is always present the desire to chisel a bit in order to cut the cost with the possibility of the equipment not meeting the requirements. Then, the advocates say "don't approve it and require it to be changed." True enough, but there may ensue a long drawn out argument or court battle with minor changes being made, requiring numerous inspections and perhaps ending up with a borderline job.

On the other hand, when the enforcing agency lays down definite requirements there is the decided advantage that owners, engineers, and equipment manufacturers know what is required and what will be approved. The enforcement officer or his plan engineer also has a set of rules to follow which makes his task easier and prevents favoritism. It is assumed of course, that the rules are fairly and properly drawn and are kept reasonably up-to-date. I am sure that most control officials will be found in the "definite requirement" group.

The remainder of this paper will, therefore, be based on a belief in definite requirements or specifications being laid down for installation of fuel burning equipment, and is based on experience in the District of Columbia. I might say that when I came to the District of Columbia twenty years ago, after having had six years experience in Cleveland, I had gained the idea that if strict installation requirements were made and enforced over a period of years, a very large measure of smoke elimination would be obtained, and so it has proved.

Application for A Building Permit

All building plans except those for single family dwellings come to us first. We check at this time (1) boiler room size, (2) ventilation, (3) stack area and height.

(1) Boiler room size: This includes a minimum clearance of 3 feet around a boiler or boilers and, at least that much above self-contained boilers and 7 feet for large boilers.

(2) Ventilation: This ordinarily consists of a fixed louvre of a minimum size at least equal to the stack area. Interior boiler rooms require a duct, and frequently a blower, to move the air into the boiler room. Care must be exercised to see that air conditioning systems do not rob the boiler room of air.

(3) Stacks: Stacks are probably the most troublesome and argumentative item with which we deal. Everyone seems to be an authority on stacks, but in truth, very few people, engineers or otherwise, have any real idea of the two functions of a stack, (a) to create draft, (b) to discharge the products of combustion at a point so as not to create an air pollution nuisance.

(a) Draft: There are a number of stack formulas. They all require numerous assumptions and in the end do not differ greatly from empirical stack tables which we use generally. Then too, engineers and architects like to know in advance, if possible, what are the requirements. We make no distinction between stacks for oil or coal, but use a lower height for gas.

(b) The nuisance consideration: The air is the sewer for the removal of air pollution contaminants. Ordinarily it is seldom, if ever, saturated, but we do find special situations as at Donora, London, and Los Angeles, where under certain conditions the air can no longer carry away the pollution. If an excessive amount of pollution is discharged at low levels, it has no opportunity to be picked up by the air currents and dissipated. Therefore it is important that the height of a stack be considered from this viewpoint equally with the height required to create the necessary draft.

This problem has become more difficult in the last two or three years because of the increasing use of induced draft equipment which tends, from the viewpoint of its advocates, to reduce stack height requirements to zero.

In order to be able to evaluate all the factors involved on the larger jobs, we require that the attached "Information Sheet", Figure 1, be submitted. A slip is then made out for the inspector in order to follow up on each job.

Application for a Boiler Permit

At some time prior to the installation of either new or replacement equipment, a permit has to be obtained. Many contractors are dilatory about this, but it is one of the many functions of the inspector to check up to see that a permit is obtained. An application form must be filed together with drawings as may be required. There are many things to be taken into consideration when checking on an application.

(1) Boilers: First of all, it is desirable to do away with hand fired boilers which are the major violators. We require all high pressure boilers to be mechanically fired, also all heating boilers of 1200 square feet of steam radiation and over. Those under 1200 square feet are practically all gas or oil fired even though they may be installed to use coke or anthracite.

We are safety conscious. We require that all boilers must be constructed in accordance with the American Society of Mechanical Engineers Boiler Code.

We are also very conscious that much smoke has been caused by overloaded boilers. We require that the load to be placed on the boiler be stated, and that the boiler or boilers be of sufficient capacity to handle this load. For steel heating boilers, we use the Steel Boiler Institute (S.B.I.) Rating Code and for cast iron boilers, the Institute of Boiler and Radiator Manufacturers (I.B.R.) Code. For gas fired boilers, the American Gas Association (A.G.A.) ratings are used. The net load ratings of the Heating and Piping Contractors Association are accepted for all boilers.

We require the package boiler manufacturers to submit test data to substantiate their ratings. For power boilers, ratings are based on the fuel burning equipment installed and the manufacturer's design. After a slow start, the use of these package units, both oil and gas fired, has increased greatly. They have given very little trouble.

(2) Stokers: In our area new stoker installations have become a rarity. However, in my opinion, they will come back; when, I will not prophesy. We have always regulated them closely, as a poor stoker installation can create smoke for a long time. We take the manufacturer's rating in pounds of coal per hour, multiply it by the B. T. U.'s in the coal used, and multiply this by the allowed efficiency (.65 percent). Dividing this figure by 240 gives the rating of the stoker in square feet of steam radiation. This rating must be equal or exceed the boiler rating.

We use a table of stoker setting heights which exceeds that of the Stoker Manufacturers Association. It has produced excellent operating jobs.

We check carefully the grate area, the size and location of boiler clinker cleanout doors, the clearance around the stoker to provide for decent operation, accessible hinged cleanout doors in breeching and stack, and an accessible adjustable damper. A drawing showing all these items must be submitted.

On high pressure boiler installations, we have required the installation of steam-air jets.

Fly ash from stokers has been a problem. We do not have a requirement for the installation of collectors, although a good many have been installed. I think such a requirement should be mandatory. We are becoming conscious that heavy oil installations are creating a fly ash problem also.

(3) Oil Burners: Oil burner installations have increased enormously in recent years, both light and heavy oil. We require a drawing showing the furnace design for all jobs. We have a stock sketch (Figure 2) for the small installations in which the dimensions can be inserted. For the heavy oil jobs, a complete layout is required. We limit the heat release to 30,000 B. T. U. per cubic foot which is the equivalent of 1.5 cubic feet per horsepower or per 140 square feet of steam radiation.

Controls are important for oil burners. We check them carefully. We believe every burner of 10 gallons capacity and over should be equipped with an electronic flame control which will shut down the burner within 4 seconds in case of flame failure. The stack switch is too slow for these large burners. All oil burners must bear the Underwriters Laboratories' label.

(4) Gas Burners: Gas fired boilers have greatly increased in number since the advent of natural gas, particularly in the smaller sizes. They have not presented any great problem, and the local public utility has been of great assistance technically and in inspecting them.

(5) Installation and Inspection: Inspectors must check every installation to see that they are installed in accordance with the permit and the accompanying drawing. When installers find out that they are being checked, they are more careful in making unauthorized changes. They are encouraged to call for the inspector to give advice or make suggestions. When changes are required, they must be followed up for completion.

As stated previously, we are safety conscious. Therefore, safety and relief valve capacities are checked carefully. It is felt that having issued a permit we are responsible that the job is safe to operate. We require that all valves must be A. S. M. E. and, be rated by the National Board of Boiler and Pressure Vessel Inspectors. We have a check sheet (Figure 3) for this purpose, and in case of a dispute, an "accumulation" test is run.

A "Hartford loop" is required in the return line of all low pressure steam boilers, also a low water cut-out on all steam boilers, and they are advocated on hot water heating boilers. All valves must be accessible from the floor.

(6) Incinerators: Incinerators are the most troublesome equipment with which we have to deal. At present, except for domestic incinerators, we have no adequate code, although one is in the making. We do have a definite requirement that an incinerator shall not be connected into a boiler stack, except in the case of a single family dwelling. Strange to say, I know of no city with an adequate incinerator code. The Air Pollution Control Association Incinerator Committee has been working on a set of "Proposed Standards" for several years. The first two sections are nearly ready to release.

(7) Ventilation: It is required that air be supplied to all boiler rooms either by a louvred opening to the outside, or by a duct which may require a blower to move the air. The area of the louvre should equal the area of the stack. Air conditioning should not be allowed to rob the boiler room.

In conclusion, I advocate wherever possible, that definite requirements be laid down for every item that may logically be considered to be part of any fuel burning installation. Shun words of no definite meaning such as "adequate", "sufficient", or "satisfactory". There is always a chance for disagreement in interpreting their meaning. Complete regulations, fairly but firmly enforced, are a benefit to all concerned, owner, contractor, and the city. They will produce surprisingly good results in preventing new installations from becoming violators, and in clearing up existing bad situations.

SMOKE REGULATION AND BOILER INSPECTION

Date ____________

Plans No. ____________ Sheet No. ____________

THE FOLLOWING INFORMATION MUST BE SUBMITTED WITH PLANS:

1. Type of building ____________ Address ____________
2. Owner ____________
3. Architect ____________
4. General Contractor ____________
5. Heating Contractor ____________
6. Heating figured by ____________
7. Number of apartments ________ Number of rooms ________ Cube of bldg. ________

HEATING:

8. Total *actual* radiation to be installed ________ sq. ft. Total heat loss ________ BTU
9. Steam ☐ Hot Water ☐ Warm Air ☐ If hot water, state the radiator water temperature for which the system was designed ________ degrees F.
10. If addition to an existing building, give: Existing rad. ________ Additional rad. ________

DOMESTIC HOT WATER:

11. Allowance for boiler load ________ sq. ft. Type of heater ________
12. Size Tank: Dia. ________ Length ________ Gal. ________ Location ________
13. If tankless, give capacity of coil, gallons per hour: ________

TOTAL LOAD

14. Heating plus domestic hot water ________ sq. ft.

BOILER: How many ________

15. Make ____________ Catalog No. ________
16. Net rating ________ EDR rating ________ New fired: Stoker ☐ Oil Burner ☐ Gas ☐
17. Boiler: Width ________ Length ________ Height ________
18. Boiler incl. brick base: Width ________ Length ________ Height ________
19. Length of boiler tubes ________ Does boiler have extended water leg ________

BOILER ROOM:

20. Width ________ Length ________ Height ________
21. What other equipment to be in boiler room ____________
22. Is there at least 3 feet clearance provided around boiler base and stoker or oil burner or other equipment ________ How many exits ________
23. What space is provided to remove boiler tubes ____________

VENTILATION FOR BOILER ROOM:

24. Louvre, size ________ Duct ________ Fan ________ C.F.M. ________

STACK:

25. New ☐ Existing ☐ Brick ☐ Steel ☐ Inside dimensions ________
26. Height from boiler room floor to top of stack ________ Height above roof ________
27. Cleanout door in base of stack: Size ________ Flue lining ________
28. Does this stack clear all adjoining buildings: ____________

ADJOINING BUILDINGS:

29. What buildings are there higher than this building ____________
30. What buildings are there lower than this building ____________

INCINERATOR:

31. Make: ________ How many ________ Type ________
32. Stack: Size ________ Height ________ Height above roof ________
33. Does it have settling chamber on roof ________ Does it clear all bldgs. ________

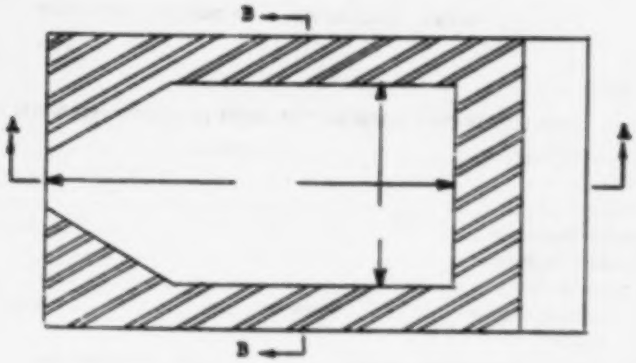
ALTERATIONS OR ADDITION TO AN EXISTING BUILDING:

34. Provide make and size of boiler and sq. ft. of radiation in existing building, in addition to the above information for the new portion.

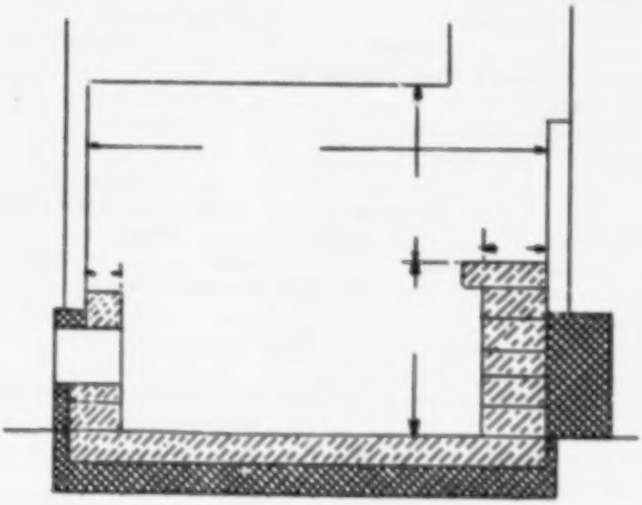
____
(Signature of Authorized Agent)

[illegible] FIGURE 1

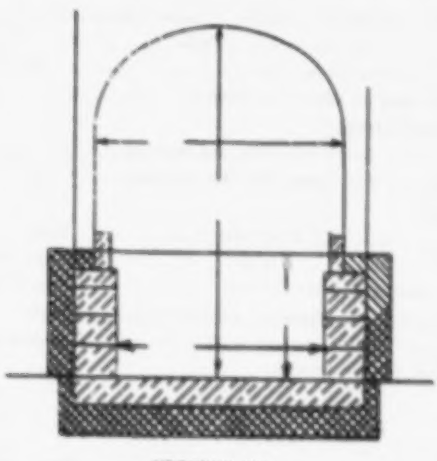
____________ Tel. ________
(Address of Authorized Agent)



PLAN OF COMBUSTION CHAMBER



SECTION AA



SECTION BB

FIGURE 2

CHECKING SAFETY, RELIEF VALVE SIZE

ADDRESS: **DATE:**

NAME OF BUILDING: **CONTRACTOR:**

BOILER:

Rating sq. ft. E. D. R. Steam, Water
Heating surface sq. ft. Steel, Cast Iron

SAFETY, RELIEF VALVE: NUMBER:

Make Catalog No. Size
Rating Total Capacity

BURNER:

Make Catalog No.
Max. Rating gals. per hr. Grade Oil

STEEL BOILER:

Heating surface X 5= lbs. steam

Heating surface X 5000= B. T. U.

CAST IRON BOILER:

E. D. R. rating X 240 (steam) 150 (water)= B. T. U.

B. T. U. ÷ 1000= lbs. steam

CHECKING AGAINST BURNER:

$$\frac{\text{Gals. oil X B. T. U. per oil X .75 eff.}}{1000} = \text{lbs. steam.}$$

OIL: No. 2 - 138,500 No. 4 - 145,000 No. 5 - 148,500 No. 6 - 152,000

$$\frac{\quad \text{X} \quad \text{X .75}}{1000} = \qquad \text{lbs. steam}$$

REMARKS:

Fig. 3 INSPECTOR

WILLIAMS: I'd like to ask Mr. Kugel to explore his statement a little further about the equipment standards bringing about a reduction in smoke for a period of time, as to how that was measured, particle sizes involved, and the possibility of more smoke in certain particle size categories now, than before the program started.

BALLMAN: As I understand your question, before Mr. Kugel answers it, you're defining this as measured particle size, not guesses - right?

WILLIAMS: He can comment on those too, if he wants to.

KUGEL: It will be impossible for me to prove my statement from a standpoint of the particulate matter involved, as we do not carry on a dustfall survey. I have had a good opportunity to make a comparison as I have been in Washington for 20 years, and I particularly refer to smoke and attendant nuisances. Washington, as you know, is not an industrial city, so that we don't have chemical plants or steel plants and similar heavy industry such as industrial cities do, so we don't have to contend with them. My personal theory is that when you are able to control the fuel burning equipment that is installed, you prevent it from becoming a troublemaker. This has been particularly important for Washington because during the last 20 years there has been an enormous building program, which still continues. Of course, it is not industrial; it consists of apartment houses, commercial buildings, the adjuncts of people living in such a community. Well, you might look at this in reverse. If you had had no control over the equipment installed in these new buildings in 20 years, you might be able to visualize what the situation would be today. On the other hand, we have had a rather strict control over the equipment being installed. I wouldn't for a moment say that none of this equipment had ever given us any trouble. I wish I could say that, but by and large, it has given us very little trouble. Now, in that same 20 years, a lot of existing equipment has worn out and been replaced. When that happens, you obtain control over the new equipment and bring that up to your standards, perhaps not always 100 percent, but as close as conditions permit. Therefore, I have seen in 20 years time, a continuous change in equipment, all for the better. I can take anyone to sections of the city which are entirely new and weren't there 20 years ago, and we would see very few, if any, violations. On the other hand, I can go to the older sections of the city and get up on the roof of a tall building, and conditions will be considerably worse. Our records of violations will show that. I can't prove this by dustfall tests because we have not conducted them, but it is my personal observation and the observation of a number of other observers. I will give you an incident. An inspector from Philadelphia came into the office late one afternoon, and said, "You know, I have been here in Washington two days and I haven't seen any smoke yet." "Well," I said, "I don't know where you've been, you must have stayed in the hotel." "No," he said, "I've been out a good deal and I just want to know how you do it." I said, "That's a pretty good boost, but I wouldn't want to say conditions are always as good as that." I felt that he was in the business, so to speak, and should be a competent observer and, as he had some very kind words for us, I took them with a grain of salt, but it pleased me nevertheless. It seemed to confirm my own observations. I don't know whether I have answered you, but I have given you my theory.

BALLMAN: To answer possibly with a little more data, and again the data is not too factual, sootfall stations are about the only measuring device that any city has had to my best knowledge, in the past 20 years. I think it can be stated, and please don't view this too critically, that the carbon content in sootfall jars has been reduced with smoke control programs that have encompassed permit regulations. I doubt if anyone can go further than that. That doesn't mean that the dustfall has been reduced necessarily, there are other things that get into that category, but the carbonacious content possibly is reduced. Unfortunately, this isn't always true. For instance, during the fall season, you get dry leaves in the sample. One of our great difficulties has been the lack of yardsticks or measuring devices by which improvement could be ascertained. This is another area where Public Health Service may be of some assistance.

KOSCIUCH: I can support you with Chicago dustfall figures. We've had dustfall surveys since 1926. Prior to that, there was a survey made in Chicago in 1912, and there were other things than dust from a chimney in the 1912 stuff. The 1912 survey was made not by dustfall, but by sweeping up a measured area. They came out with the statement that one third of the dust that they got was the product of horses. In 1926, a survey came out with a figure of 89 tons per square mile per month of combustible material. We still had some horses then, but not so many. 1938's survey dropped it down to 20. The present year is running about 7 tons per square mile per month, on an average. Our overall dust picture for the last 7 years has been rather constant, around 55. We've had permits in effect since about 1938, and an annual inspection since 1938.

BALLMAN: Chicago was one of the first to have permitting and annual inspection activities. I think Frank Chambers' innovations started permitting of equipment. Do any of the others who had dustfall studies want to say more about this carbonacious material decrease?

JOHNSON: I want to say something about new equipment. One thing that does reduce the amount of fly ash from underfeed stokers is good automatic air control. We found that many old stokers were running with very high excess air, which resulted in high fly ash carry over into the stack. Modern stokers with good air control have considerably reduced fly ash discharge from the small stoker. One thing I might mention about new equipment: we are now getting into the installation of large gas burners. Prior to the time we entered this field, we would find CO_2 on many boilers of 3, 4, and 5 percent. Now we are getting better installations, CO_2 in excess of 8 percent on all of our gas burners, and some of the big ones now are running 10-1/2 and 11 percent CO_2. When you consider the number of cubic feet of gas consumed in that type of equipment, this means a big financial saving for the owners of this equipment.

STEAD: I would suggest that it's high time to recognize the need for readjustment in our thinking about smoke and dust. To illustrate: in the field of gas analysis, there are usually three stages that one goes through, first of all, you evaluate emissions in terms of tons. Second, when you discover that you can't average apples and oranges successfully, you begin to distinguish between the chemical composition of these various tons of this and tons of that. That's a second phase, but still not good enough, and you really don't have a grasp of your problem until you recognize the physical form in which those compounds exist. I would suggest that we have to go through a similar line of thinking in the field of smoke and dust. Consider first, the gross measuring stick one could apply: namely, dustfall --- what falls out of the air. Actually, that is the thing in which you probably have the least interest from the standpoint of public health. The second approximation or refinement would be a measurement of what remains in the air, by weight and composition. Now we're getting at that through the Public Health Service nation-wide aerosol sampling program which Dr. Chambers has discussed. The final refinement, and the one that I think is the real trick, is the evaluation of what remains in the air by particle size and particle number. I think that's the point you were getting at. To my knowledge, I've only heard two instances where studies of that nature have been carried on. The first, of course, is dust evaluation in the field of industrial hygiene, with some 20 years of history behind it. The second, and the thing that I think is most thought provoking, is the electron microscope counts of particles of one-half a micron diameter, or less, that are present in the air on smoggy days and non-smoggy days, and the work done by Bush at the University of California, indicating a tenfold difference in the counts of these particles on clear and smoggy days. Since these particles have diameters approximating the wave length of light, and their light scattering ability is extremely closely tied in with the transparency of the air or visibility, I would suggest it is high time in a group like this, where we're from different backgrounds, that we try to come to a common denominator rapidly; come quickly to at least the second stage I mentioned in terms of dust or smoke. Let's talk about what is small enough to remain in the air, and as rapidly as possible, let's get down to particle numbers of a given particle size on an organized, orderly, continuous measurement basis.

BALLMAN: I believe, sir, that you're keynoting future meetings. Today we are meeting to find out where to start. We are attempting to move from an art into a field of scientific endeavor. Definition is most important, separating the apples from the oranges. If large particles fall on you, your hat gets dirty; the very small particles you breathe — which has priority for correction? Is the lack of visibility important if it does not portend adverse conditions affecting well-being? These require definition.

Our next speaker is Mr. Howard J. Scott, Commissioner of Air Pollution Control for the City of Cleveland; he has been actively engaged in this work for a number of years. Mr. Scott has also been very active in air pollution work with several technical societies.

Permits, Registration, and Certificates of Operation

Howard J. Scott

The most important tool in the control of air pollution is an accurate inventory of all devices that may cause an air pollution problem. The control of new installations alone is not enough. Existing devices must also be covered in this inventory. To assure all new installations being recorded, registration of contractors doing the work of installing devices under the jurisdiction of the program, should be registered. To maintain a proper inventory, permits, registration, and Certificates of Operation must be considered as one and tied together.

Permits

In issuing permits for the installation of new equipment, forms should be devised whereby all pertinent information is contained. The approval of permits should be based on the anticipated performance of this equipment. Generally, industry should be allowed to devise their own means of accomplishment of satisfactory operation. To accomplish this, in the analyzing of permits, qualified personnel with knowledge of all types and phases of the application, should be required. The permit application should be submitted to the approving authority before an actual contract is entered into by the company purchasing or installing the equipment. This will necessitate making a decision regarding air pollution control equipment before a contract is entered into, and thus produce a completely engineered installation.

The original design, including all phases of air pollution control equipment, usually increases the entire project cost considerably, but if control equipment is not discussed as part of the original concept, control equipment is oftentimes difficult, if not impossible, to install, at a later date. There are many ways of accomplishing the desired end, and the actual operation of equipment should be thoroughly discussed, so that a wise selection can be made of the basic equipment.

The limitations of each integral part should be discussed thoroughly with an understanding of the overall effectiveness of the combination of all component parts. It is not unusual for a consulting engineer to spend months in preparation of plans for a project that results in an unbalanced condition or limitations of component parts that will result in the entire installation being extremely unsatisfactory. As an example, in a multiple boiler installation with process and heating load, with the boilers fired with spreader stokers, if the process load is not a reasonable percentage of the capacity of one boiler, we can expect unsatisfactory performance from the unit during the summer months. The size of the individual units should be such that the summer load for one boiler would be the most serious item in considering a selection of equipment made to assure this condition giving satisfactory performance. The maximum, or total load during winter conditions, should result in a reasonable load on more than one boiler. Poor engineering or analysis of facts has resulted from this point in many unsatisfactory installations. In the field of incineration, it is also very difficult to obtain reliable data on the amount and type of material to be disposed of. It is also extremely difficult to evaluate an incinerator design and determine whether or not satisfactory performance can be obtained, due to the lack of acceptable and reliable information in this field. The difficulty of approving an application for an installation brings about the necessity of tying in the permit application to an operational certificate that is withheld until such time as satisfactory operation is obtained. In other words, unless the operation of the equipment meets Code requirements, you have an additional hold or tool, to use to force the additional air pollution control equipment, if necessary.

Installation permits should cover all devices under the jurisdiction of the authority, including steel and metallurgical operation, chemical and manufacturing processes. Little attention has been paid to these other phases of air pollution. There is some correlation of data for combustion equipment, but the control of combustion equipment alone, in most major cities or districts, will not staisfy the public and eventually all sources of air pollution must be controlled. Active cooperation with industry and education of the need for control equipment in this field is absolutely essential.

Registration

To assure applications for new installations being submitted, registration of all contractors making such installations should be mandatory. This will provide a forceful weapon to use against unscrupulous contractors that have a tendency to go ahead and make installations without getting the necessary permits. Registration should be in various categories and include the sale of equipment, as well as the installation. This gives you an additional control over installations that are made without the assistance of a consulting engineer or any engineering plans being prepared before the installation is started.

The largest plants, with complete engineering staffs, usually know where they are going and prepare proper plans and make proper selection of equipment, but the smaller plants, generally operating under limited funds, have no general or overall scope or knowledge of their process and go on in a helter-skelter manner. It is in this group that registration will be of the greatest benefit.

Certificates of Operation

Existing equipment can constitute a major problem in air pollution control work. The expected life of most devices is from 20 to 40 years. With the rapid progress of industrial development in making installations more satisfactory and economical, frequently an extremely costly unit becomes obsolete in one or two years. For this reason, an evaluation of all devices should be made periodically and Certificates of Operation issued for them when they can operate without creating a nuisance to the public. Where they cannot be operated without creating a nuisance, a definite program for replacement or modernization should be instigated to gain satisfactory performance of the unit within a reasonable length of time. The air pollution control official is generally in a very hazardous position when it comes to dealing with existing equipment. When such equipment has been in operation for years without objection and then, due to neighborhood complaints or more restricted air pollution legislation, he finds that he must control or bring about reduced emissions of the operations of this existing equipment, he must by purely cooperative effort gain compliance with his recommendations.

In the operation of the program where Certificates of Operation are required, the air pollution control authority should have the right to revoke the Certificate and prosecute for operation without it, if recommendations for compliance with air pollution emission rates are not obtained. Using this method of enforcement, the burden of proof of operation within the limits falls upon the industry involved, rather than the enforcement agency, and the only facts that have to be established in court are that the equipment was in operation, and that they had not complied with the recommendations issued for compliance.

Summary

For a Division of Air Pollution Control to operate efficiently, they must have an inventory of all equipment under their jurisdiction. Permits backed up by registration of installers and Certificates of Operation brought about through periodic inspections, will produce this inventory. The major problem remains in having a staff capable of analyzing the facts and doing something about the problem. Technically trained personnel, with a full knowledge of the problems involved, is extremely difficult to obtain at salaries paid by enforcement agencies. The problems must be segregated into fields of competency of the staff available and a satisfactory solution obtained through a staff conference approaching the problems from the various engineering aspects. The air pollution control agency must have additional limits of emission established for the control of other than smoke and fly ash that are reasonable and enforceable. Engineering data must be made available to evaluate operation of all equipment coming under its jurisdiction so that he may determine anticipated performance, without waiting for a nuisance to be created. For successful air pollution control programs, the air pollution control officials must be taken out of the category of being judge and jury, as well as the enforcing officer. The limitations of his effectiveness should be understood by the public. The problems of air pollution control have been developing for many years, and there is no easy solution of any of them.

BALIFF: I have a question, actually not only to Mr. Scott, but to the other people who spoke previously. It's a general question, and I've been purposely waiting until late in the afternoon to bring it up. Mr. Scott made me ask it now, because he inferred that there's a difference in enforcement between smoke and nuisance dusts. Now, I take issue at that. I believe one of the things we need in air pollution is a definition of the so-called nuisance dusts, ordinary limestone dust, or dust from various industrial processes for which I don't believe you could (as one of the early speakers this morning said) prove a health hazard, and still the housewife, who has to clean it off the windowsill or who has to sweep it off the porch, objects to it very much.

H. J. SCOTT: As an explanation of that question, I would like to say that as an air pollution official, if it's dust - it's dust. As our ordinance reads, it is fly ash or industrial nuisance dust. That I must apologize for.

We are in the process of correcting that situation. I sincerely feel that to say fly ash from combustion processes with particles purely of carbon or the products of combustion — particularly solid portions of products of combustion — and issue a maximum dust emission rating — is not right, because there are a lot of other emissions. We are particularly perturbed with open hearth dust in Cleveland. We have 30 open hearths right in the heart of the city. You can look down from the Terminal Tower, which is in the center of the city, on 30 open hearths within, I would say, 2 miles. There are also 10 blast furnaces and a number of coke oven batteries — each one of them about 100 ovens per battery. So, Cleveland is an industrial town. It's a steel town — it's a chemical town. It's a small industry town — naturally we can't have the type of ordinance they have in Los Angeles. The people wouldn't permit it. They want to work. These companies employ them, and naturally if we promote regulations such as they have in Los Angeles, it would increase the cost of steel, I would say, at least $2.00 a ton, which would price the steel industry in Cleveland out of business, unless every other city in the country did the same. I think that we have to get down to an overall efficiency of not less than 85 percent. I think it's entirely possible to obtain that, and I think that we've got to class all of this in the same category and do away with the one provision for excess air and temperature.

KOSCIUCH: In regard to permits, we can support Mr. Scott on the operation certificate for a permit. We've had a lot of trouble with new flue fed incinerators, like Dr. Greenburg in New York. Last August, the department issued a memo to architects, contractors, etc. that we are not approving plans for new flue fed incinerators as of August 23, 1954. There was a protest from architects that we were spoiling their pretty picture — but that was the strongest protest that we got, and there hasn't been a brand new flue fed incinerator installed in Chicago since then.

H. J. SCOTT: Sir, again, you took the bull by the horns and have done something and have gotten away with it. I think it's a good idea. I hope that you can continue. I don't think that the flue fed incinerator is so bad that you can't control it, but if that's the way you want to do it, you accomplished your end.

MC CABE: I would like to comment on this problem of dust collection and chemical fumes. I think we probably need to re-examine our ordinances in cities, because what most of our cities have are smoke or fly ash ordinances that have not been modernized in a long time. Now you spoke of $2.00 a ton in Cleveland for collection of dust from open hearth furnaces. I have confirmed this with Mr. Rose here. In Los Angeles, we found the capital investment cost was two cents a ton. Now most of those open hearths have put in waste heat boilers to generate steam which they didn't do before, and the operating cost is very low. I think probably what we need is cost data if we could get it for the Los Angeles installations, this would be helpful. We used to argue costs in the case of coffee roasters. In the beginning, it was estimated that it would cost $40,000 to put in a combustion unit on a coffee roaster. Now it is being done for $3,000 or $4,000, isn't it?

ROSE: $1,200.

MC CABE: In the beginning we talked about $50,000 for a gray iron foundry dust collection system. Those are only $7,000 or $8,000 now, so this thing isn't as much as we scare ourselves into believing in the first analysis.

H. J. SCOTT: Dr. McCabe, I'll have to apologize for a little ulterior motive there. Mr. Rose and I had discussed this problem a bit about the cost of say, electrostatics on open hearths, and this discussion shows, for an example, what we can get out of an exchange of real technical information. The cost of electrostatic precipitators is reasonable, but yet the local companies that I deal with insist that the expenditure involved would increase their price at least $1.00 a ton, and maybe $2.00. I'm not a steel man — how can I win without facts? But here, among you people who have dealt with the same problem and have actual cost data, you can throw it on the table in the hopper and show us; this is what it costs in Los Angeles, this is what it costs in Detroit, this is what it costs in Pittsburgh — why should it cost a hundred times that in Cleveland? It's not reasonable. Now there's an example of what we can get out of our knowledge of the problem and exchange of information. Thank you.

WILLIAMS: My thought is along the lines of Mr. Scott's statements on devices to get a job done. Now actually, I doubt that we're going to put many industries out of business as we go into air pollution control programs, so therefore, it becomes a job of enforcing good industry practice. Therefore, why shouldn't industry have a reasonable place in determining what those standards are; as long as they are ethical in their relations and are not organized as groups for the protection of "air polluters". Along that line, we in Illinois have had very good success in the plumbing field with manufacturers in determining ways in which they can break cross connections to various devices. We, by ourselves, can stumble along for years and never find the answer, but if we bring a problem to industry, in the proper light and with proper representation, things get done, done right and in a hurry. So, I would think it would be in order for this group to explore the possibilities of setting up some good mechanism to work with the various segments of industry, even more than is currently being done.

BALLMAN: May I say that these mechanisms are already set up. The Public Health Service has every right to believe that they will be able to work with industry groups who are already set up in Air Pollution Control Association for just that purpose. They are presently attempting to write specific industry manuals. The steel industry alone is spending quite a bit of money for the preparation of a manual, which will describe emissions from the specific sources of their operations — what they know — what they can do — areas they have to explore -- etc. This activity is also going on in incinerators, steel, railroads, oil; there are 13 or 14 of those industry committees already functioning.

Our next speaker has been in air pollution control work for quite a long time. He's worked with Ray Tucker, who is a known authority in this field. J. H. Carter is a very capable man, he's well recognized for the work they are doing at St. Louis. May I introduce J. H. Carter, Commissioner of Division of Smoke Regulation, City of St. Louis.

Fuel Regulations

J. H. Carter

When the air pollution problem is clearly one of smoke emitted from thousands of chimneys serving as many assorted residential and commerical heating units, regulation of the fuel permitted to be burned is the surest and quickest solution.

The first major action of this kind was passage of the St. Louis anti-smoke ordinance of 1940.* Steps in that direction had been taken by other cities several years previously** and by St. Louis in 1937.*** The 1937 ordinance required the washing of coal under 2 inch top size, and the companion ordinance, proposed as an enforcement measure for this provision, was enacted at that time. This latter is the ordinance which requires each hauler or seller of solid fuel to obtain an annual permit or license from the smoke commissioner to do business in the city.

Similar legislation subsequently has been adopted by several localities, including Pittsburgh, Cincinnati, Allegheny County, and many others. The author, having first hand knowledge of the way these provisions are enforced in St. Louis, will confine his discussion entirely to that city.

The restrictions imposed by ordinance on solid fuels for use in St. Louis, are these.

1. High-volatile coals must be in sizes which will pass through a 2 inch circular opening and must be washed to the point where their ash content will not exceed 12 percent on a dry basis. Such fuel may be used only in mechanical fuel burning equipment.

2. Low-volatile fuels, i.e., those containing not more than 23 percent volatile matter on a dry basis, are required for hand firing.

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* St. Louis, Missouri Ordinance No. 41804. Approved April 8, 1940.

** Tucker, R. R. and Carter, J. H. "Some Legal Foundations for Air Pollution Control" Proceedings Third National Air Pollution Symposium, 1955

***St. Louis Missouri Ordinance No. 40999. Approved February 11, 1937

The greater part of the city's high-volatile coal comes from the Illinois fields just across the Mississippi River. When a high-volatile mine requests to be put on the list as an acceptable supplier, the Division of Smoke Regulation requires that samples of the sizes intended for the St. Louis market be obtained at the mine by a reputable and disinterested chemist or his representative. At the same time the chemist examines the preparation plant. This is done at the expense of the producer or his agent. The chemist's report shows dry basis ash analyses of the samples he collected and states that, in his opinion, the mine should be capable of consistently producing coal of similar analysis. The mine then files a completed data sheet, giving information concerning the operation which the division believes it should have, and is assigned a mine number. These numbers are arbitrary and are preceded by an initial or initials designating the state in which the mine is located.

These mine samples are not always taken just to supply information for this purpose. It might be that equally careful sampling and analysis had recently been completed for some commercial account or that the Bureau of Mines had lately made a routine sampling visit at the mine. Any analysis of equal validity will be given consideration.

The procedure for having a low-volatile mine put on the list is similar, except that not so much emphasis is put on the preparation plant. Preparation of the coal at the mine may have everything to do with its ash content but affect its volatile content only slightly. The fields in which these coals are mined all lie at considerable distances from St. Louis. Analyses are accepted from testing laboratories in all parts of the country, providing the analyst can vouch for the origin of his sample. Samples sent in to laboratories by operators, samples taken from cars at destination, etc. are not acceptable. Any analysis which can be definitely tied down to one certain mine will be. Certified copies or photostats will serve if originals are not available. In all cases the completed coal mine data sheets are required.

However, it is not sufficient to know what sort of coal a mine can ship — its actual performance should be checked from time to time. This is particularly true of mines located in areas where the coal comes very close to the legal volatile limit or mines whose washing facilities do not appear to be any too adequate. Accordingly, the division's inspectors are sent, on occasions, to take samples from cars being unloaded on siding, from trucks dumping at destination, from stock piles in dealers' yards, and even from bins. These are analyzed at the Municipal Testing Laboratory. Sometimes, this sampling is requested — sometimes it is a surprise visit. Sometimes, it is done to determine whether or not a mine stays on the accredited list.

Recently a mine opened up in Oklahoma and made request to ship low-volatile coal to St. Louis. Numerous analyses by the chemist of core samples and later of the first few day's run of the mine, showed the volatile content to be just under 23 percent. Tentative permission was given for the mine to ship to the city with the provision that the commissioner be given, in advance, each car number and destination. The first 7 cars received in town, sampled by our inspectors during unloading, all analyzed over 23 percent volatile matter. The mine's temporary permission was withdrawn.

Another source of checks on coal brought into the city, lies in the analyses made daily of coal bought by various departments of the City government. All of this is purchased on specification, and each load is sampled. The samples, sent to the Municipal Laboratory, are tested and their analyses transmitted to the departments involved. By arrangement with the laboratory, copies of all of these are sent to the smoke commissioner's office.

The St. Louis ordinance provides that, "if a fuel contains volatile matter in excess of 23 percent on a dry basis, it shall be acceptable -- provided that it meets the same standards in regard to smoke production as that of fuel containing less than 23 percent." One such fuel has qualified for hand fired use in St. Louis. The fuel is a briquette made of southern Illinois fines having a high concentration of fusain.*

The tests upon which this fuel's acceptance was based were run in the mechanical engineering laboratory of Washington University by faculty personnel. The briquettes under question were fired alternately in identical stoves simultaneously with solid fuels known to contain less than 23 percent volatile matter set by ordinance. Emitted smoke was measured by means of photoelectric cells. All costs of the tests were paid by the manufacturer of the briquettes.

From time to time, a listing of all approved mines is published in the form of a booklet known as "Sources of Solid Fuel". In addition, to the mine number of each mine, are shown the name of the operating company, and location of the mine, shipping point, and railroads serving it, and the commercial sizes approved for shipment to St. Louis. These booklets are distributed free to the coal industry of the city -- to buyers as well as to dealers and wholesalers.

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* Piersol, R. J., "Smoke Index." Proceedings 34th Annual Convention, Smoke Prevention Association of America, Inc. 1940

When the solid fuel delivered in a city runs into the millions of tons a year, it is obvious that the solid fuel dealers can play a big part in the success or failure of any attempt at fuel regulation. This was so apparent to the framers of the first fuel regulatory ordinance in St. Louis, that they decided it would be necessary to put the dealers, themselves, under regulation. This was done by providing in a separate ordinance that "no person shall produce, import or haul solid fuel, nor store any solid fuel for immediate or future hauling for use in the city, without first obtaining a solid fuel permit to do so...."* These permits are issued upon application to, and approval by, the smoke commissioner, and are renewable each year. Provision is made in the ordinance whereby a permit may be revoked or its renewal refused. Herein, of course, lies the regulatory power. A dealer without a solid fuel permit is out of the coal business. The dealer is assigned a solid fuel permit number which he keeps as long as his permit is in force. This number must be painted on the sides of his trucks. In addition, he receives each year, as he renews his permit, a decal for each truck windshield. These decals are in different color combinations from year to year, so as to be readily distinguishable.

At the time the first fuel regulations went into effect, it was realized the purchaser should have some assurace from the dealer as to the legality of the fuel delivered to him. St. Louis, like most cities its size, requires the bonding of all public weighers and the use of a standard weight certificate to accompany each delivery. This weight certificate offered a means for providing this assurance, and the Weights and Measures ordinance was amended to include the following. "All the certificates and copies shall show the solid fuel permit number provided for in Ordinance 41173, of the City of St. Louis,the time of the weighing thereof, and shall show the true gross, tare and net weights, and shall also state the name and address of the purchaser, the seller's name and address, and the origin of said coal, coke or other article....and shall correctly describe the quality, kind, size and character of the same."** Origin of the fuel is identified by use of the mine numbers previously referred to. All weight certificates printed since the above amendment was adopted have provided blank spaces for the dealers' solid fuel permit number, the mine number, and the required description of the fuel as to size, etc.

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* St. Louis, Missouri Ordinance 41173. Approved October 28, 1937

** St. Louis, Missouri Ordinance 41274. Approved March 9, 1938

The St. Louis ordinance of 1940, and most of the ordinances adopted by other localities in the following years, contained a clause which provided that, in the event the established channels of trade in the city did not provide an adequate supply of smokeless solid fuel at a price commensurate with its value, an emergency could be declared and the City Administration could enter the solid fuel business by buying and distributing on its own account. This authority given to the local government may have had considerable weight as a "sword of Damocles" hanging over the heads of the established coal dealers, but in St. Louis it was never used — nor was it, to the best of the author's knowledge, in any other locality.

No major difficulties in the enforcement of the solid fuel regulations have been encountered. The most trying periods were those years during World War II, when sufficient quantities of low-volatile coal to supply the city's needs, never seemed to be in sight but always arrived somehow in the nick of time — largely due to the efforts of a group of influential citizens who gave much of their time to this problem.

To be sure, there have always been a few small "bootleggers" who have tried to profit by peddling illegal fuel by the basket. This practice has declined -- partly due to vigilance in enforcement and partly due to the replacement of many coal stoves by heaters burning oil and gas. It is interesting to note that in the fiscal year 1941-42, the division had 148 solid fuel actions in Police Court, and during the fiscal year just closed, only 17.

OVERSTREET: Not commenting particularly on your talk, but I just want a bit of information. I assume that the prepared coal which you spoke of is the briquette manufactured around Ziegler and Christopher, Illinois.

CARTER: By Old Ben.

OVERSTREET: Now they have two kinds; one in which they use a straight asphalt compound as a binder, and the other in which they use asphalt and starch.

CARTER: One is for shipment to the territory and the other is for shipment to St. Louis.

OVERSTREET: I realize that. The one in which starch is used with asphalt as a binder is known as the St. Louis briquette. But can you build a fire in an ordinary stove with your St. Louis briquette without freezing to death on a cold morning before you get the fire started. In other words, my question is this: Is the briquette only applicable to be used in hand fired boilers where the fire is continuous? We got them, anticipating using them in space heaters of small commercial installations such as upholstering shops, but they burn up overnight — you can't bank it.

CARTER: Oh well, that's pretty generally true.

OVERSTREET: Then are you just using them in hand fired boilers where heat or steam is maintained continuously?

CARTER: They're using them in small stoves and heaters. I wish they wouldn't, but they are. When the railroads were burning solid fuel, the Burlington used it exclusively in the St. Louis terminal.

OVERSTREET: I encouraged the use of them in Paducah and had them stocked particularly for the purpose of using them in little stoves found in service stations, garages, paint shops, upholstering shops, and the experience was most disappointing because these fires would go out overnight before they could be rekindled and heat obtained the next morning; on cold days they were until noon getting heat.

CARTER: Well, I don't think you will have any success with any fuel that runs 35-36 percent volatile. You won't keep a fire all night unless you have a pretty big firebox space.

OVERSTREET: Well, next morning though, as I say, you would freeze while trying to get a fire started with briquettes. I thought you had a plan though where these could be lighted off satisfactorily.

BUNTS: What did it add to the cost of the home owner in the cost of heating his home, when you regulated the fuel?

CARTER: It cost some home owners a little more, and it cost some home owners actually less. We have people who told us it cost less to heat their house than it used to before, and that's not hard to explain. In those days, Illinois coal was selling for $4.50-$5.50-$6.00 a ton for a good grade of coal (you could get by cheaper than that) and when the smokeless coals first came on the market, they were about $9.75-$10.25. When you're paying $10.00 for fuel that you used to get for $5.50, brother, you take care of it. That was the big thing — it was the psychological angle as much as anything else. Those people just didn't go down and heave the stuff, like they used to heave the other. They got to be better firemen, and they kept just as warm.

BALLMAN: May I take this opportunity to reiterate what Dr. Greenburg stated before; first, my deep thanks to Mark Hollis and Mr. MacKenzie for their help earlier when we were going through the days of passage of Public Law 159. I'd like to say to you gentlemen, that Public Law 159 had considerable backing not only from our association but from all the groups that it represents. One point I'm trying to get across, this is not just a Public Health Service effort — it seems to be a unified effort of many people, and I think for that reason that it will be very well worthwhile.

Film - "Smog Men At Work"

STATE AIR POLLUTION CONTROL PROBLEMS

Wednesday, September 21, 1955 - Morning Session

Joseph E. Flanagan, Chairman

FLANAGAN: Yesterday afternoon, we heard from many of the folks who are concerned directly with the problems of local air pollution control. This morning's session is devoted to the problems of State air pollution control. One of the difficulties of this, in this particular panel, is that there are very few states, as you all know, that are actually in this business on a formalized basis, although many of the State Health Departments and other governmental units become involved in chasing down nuisance complaints, etc. without specific legal authority to control other situations. Our first speaker is Mr. Curtiss M. Everts, Jr., the Director of the Division of Sanitation and Engineering of the Oregon State Board of Health in Portland, Oregon, who will discuss his experiences in developing a State-wide control program.

Experiences in Developing A State-Wide Air Pollution Control Program

Curtiss M. Everts, Jr.

Introduction

Before discussing the details of the Air Pollution Control Program in Oregon, it is probably appropriate that the geography, population distribution, and industrial development be described briefly for the benefit of those who have not had the pleasure of visiting our magnificent state. The land area of approximately 97,000 square miles may be divided roughly into two distinct geographical and climatic regions: Western Oregon consists of the area west of the Cascade Mountains extending about 100 miles to the Pacific Ocean. Except in the mountain areas, the elevations are generally less than 1,000 feet and the rainfall averages about 35 to 40 inches per year. Although Western Oregon includes only about a third of the land in the state, 85 percent of the 1,700,000 citizens reside there. Extensive forests of Douglas Fir, Hemlock, and Spruce exist particularly in the southern half of the region. The Willamette Valley, where diversified agriculture is carried on, is located in the northern part of the area. The City of Portland, situated at the extreme north end of the valley, is just south of the confluence of the Willamette and Columbia Rivers. The population of Portland and its suburbs is over a half million, and it is the largest center of diversified industrial development.

Eastern Oregon is located east of the Cascade Range and extends to the Idaho State line. It occupies two thirds of the land area but contains only about 15 percent of the state's population. The elevations are in excess of 1,000 feet and the area is semi-arid to arid, except for the mountains, and the land used is predominately lumbering of pine forests, livestock, and grain production, and diversified agriculture which is carried on in the irrigated valleys.

Compared to many states, Oregon is still relatively sparsely settled and is not yet highly industrialized. Its principal industrial development is based upon timber and lumber products. Because of extensive forest lands, Oregon's lumber industry has long been foremost in the economy of the region. Agriculture, tourist business, and fisheries are also important in the area's economy. Situated in the center of the greatest present and potential hydroelectric development of the entire Nation, Oregon as well as other states in the Pacific Northwest, is destined to expand greatly in population and industrial development. The past 14 years have witnessed a phenomenal growth in population and the entry of chemicals industries, heavy metals production, fabrication plants, electrometallurgical processes, and many others. Portland has already been mentioned as Oregon's largest city. The second largest metropolitan district in the state is in the Eugene-Springfield area, which is approximately 100 miles south of Portland, and contains a population of about 80,000. The next largest city is Salem with a population in excess of 50,000, and in which the capital is located. There are 10 other communities in Oregon with populations from 10,000 to 25,000.

Factors Encouraging a State-Wide Control Program

In other parts of the nation the control of air pollution has been usually associated with highly industrialized communities. In the past few years, proposed State statutes to establish study or control programs have been considered by many State Legislatures. However, these efforts have resulted in only three states having separate legislative acts and four states operating a program by specific executive authorization or by use of funds allocated for the specific purpose. It can be anticipated that many more states will be establishing study and control programs in the future. The experiences in Oregon therefore, in the development of the air pollution control statute, may be of some assistance. Many of you are probably wondering what conditions developed that caused the State of Oregon to undertake an air pollution control program. By 1950 there already existed a number of air pollution problems which affected specific localities in the state. These included the emission of fluorides from aluminum reduction plants, odors from the Kraft type pulp mills, deposition of cinders and fly ash from steam generating plants and waste wood burners, and dust from the production of cement. These local problems, together with the anticipated population growth and industrial development, were cause for concern to many governmental, industrial, and agricultural groups.

The successful experience of the State with its water pollution control program also had a distinct bearing on the general attitude toward air sanitation. Cities and industries together had spent in excess of $40,000,000 to restore the waters of the State to a condition in which they could be used for reasonable and beneficial purposes. It was also agreed, however, that the objectives of the water pollution control program could have been attained more quickly if the work had been started 10 years earlier, and would have resulted in a saving of many millions of dollars to both cities and industries.

In April 1950, Douglas McKay, then Governor of Oregon, appointed a sub-committee on Air Pollution from his advisory committee on natural resources. This sub-committee was instructed to consider Oregon's present and future air pollution problems, and to furnish its report and recommendations to the members of this parent committee. Members of this sub-committee represented the following groups: State Board of Health, State Sanitary Authority, State Department of Agriculture, Oregon State College, League of Oregon Cities, and industrial and commercial groups. After making a careful study of existing conditions in the State and arriving at the conclusion that air pollution would become an increasing problem in the future, the committee recommended the adoption of a proposed statute which they had prepared in consultation with all interested groups. The legislation introduced in 1951 proposed an extension of the water pollution control statutes that would include the control of air pollution. It was found, however, that to proceed with this approach, would require a revision of the statutes under which the State Sanitary Authority was carrying on its water pollution control program. Such a revision was not desirable at that time. Instead, the initial bill was revised to set up a separate agency as a division in the Board of Health to operate the Air Pollution Control Program.

Public hearings on the proposed statute to establish a study and control program resulted in initial opposition by representatives of various industrial groups. The definition of what constituted air pollution was the main point of disagreement. In the proposed statute, air pollution was defined as, "the discharge of solids, liquids, and gases in such concentrations that caused injury to human, plant, or animal life or to property constituted a public nuisance and was contrary to the policy of the State of Oregon." The industrial representatives believed that the definition made a substantial addition to the common law definition of a public nuisance; that, as such, it was not justified. The definition of air pollution in the statute then was revised to read that, "the discharge into the air of solids, liquids, or gases so as to cause such injury to human, plant, and animal life or to property as constitutes a public nuisance is contrary to the policy of the State of Oregon."

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Although this change in a legal sense was substantial, the proponents of the legislation did not envision primarily an intensive program of legal enforcement. Instead, the emphasis was more upon establishing a cooperative program of both prevention and control. The other main point of opposition was the belief that a study effort should precede any control program. The explanation that the proposed statute as written did require that a study of air pollution conditions precede the control activities inspired most industrial groups to actively support the legislation.

Provisions of the Oregon Air Pollution Control Act

The statute passed by the Legislature created a five man authority as a division of the State Board of Health. The State Health Officer and a member of the Sanitary Authority are ex officio members. The other three members are appointed by the Governor for four year terms, with no specific requirement as to residence or field of interest. The State Sanitary Engineer is the technical secretary. The statute specifically authorized the Authority to carry on the following functions:

1. Develop a comprehensive program for the prevention and control of all sources of pollution of the air in the State.
2. Advise, consult, and cooperate with other agencies of the State, political subdivisions, industries, other States, and the Federal Government in the furtherance of the purpose of the Act.
3. Encourage and conduct studies, investigations, and research relating to air pollution and its causes, prevention, control, and abatement as it may deem advisable and necessary.
4. Collect and disseminate information relating to the prevention and control of air pollution.
5. Adopt rules and regulations.
6. Consider complaints, make investigations, hold hearings.
7. Require the submission of plans for the removal of air contaminants.
8. Encourage voluntary cooperation by the people, municipalities, counties, and communities and others in restoring and preserving the purity of the air within the State.

9. Employ personnel, consultants, purchase materials and supplies, and enter into contracts as necessary.

10. Gives the Authority representatives right of entry upon any private or public property, except private dwellings.

11. Enforce compliance with the laws of the State.

12. Represent the State of Oregon in any matter pertaining to plans, procedures, or negotiations for interstate contracts or interstate air pollution.

The Act also provides for three types of proceedings to abate public nuisances created by pollution of the air as follows:

1. By official notice to persons responsible for creating public nuisance conditions, requesting abatement, and allowing a reasonable length of time for correction.

2. If corrections are not made, a public hearing is conducted where all evidence connected with the case is heard by the Authority. At the conclusion of such a hearing, and based upon the evidence produced, the Authority is required to enter an order that in its opinion will best further the purpose of the Act.

3. Whenever conditions are such as to require immediate action to protect the public health or welfare, the Authority may take such action as it may deem advisable for summary abatement of any nuisance conditions created by atmospheric contamination. The Act also provides for an appeal by any person substantially affected by an order of the Authority, and in this case, the court has complete jurisdiction of the matter.

Initial Program

The Air Pollution Authority held its first meeting in August 1951, elected officers, and undertook a program to obtain qualified personnel. Almost a year's delay in beginning field and office activities occurred due to the difficulty in securing adequately trained staff to conduct field investigations. During the summer of 1952, two engineers and one chemist, experienced in other public health programs, were transferred to the Air Pollution Section. By this time, approximately 50 complaints were on file involving mostly combustion and dust emission problems. The initial field investigations consisted of determining the nature and extent of these problems and the area data needed to ascertain whether or not the complaints were justified.

The collection of basic data was begun with the establishment of 155 particle fallout stations in representative areas of 40 communities throughout the State. All of these fallout stations were operated for a period of at least one year, principally to determine the rate of fallout in each region that would cause nuisance conditions if the value was exceeded.

Obviously this measurement described only part of the pollution problem, but it was fortunate that many of the complaint conditions could be investigated with this relatively simple method.

The employment of another engineer and chemist permitted an expansion of the air sampling program to include SO_2 determinations, fluoride concentrations, oxidant values, high volume filter samples (from which values for organic and inorganic material in air can be obtained), hydrogen sulphide, and many others.

There were many limitations that dictated the type of program that could be operated. The biennial appropriation of approximately $90,000 restricted the number of persons on the technical staff, which created a continual problem of having a small staff working in a large area. In addition, there was almost complete lack of municipal activity on smoke and dust control, not to mention other air contaminants. During the development of the sampling program, it was soon learned that the type of sampling equipment then commercially available to describe outside air pollution was very inadequate. Another obstacle was the lack of standards to limit the concentration of air contaminants in the outside atmosphere. In order to start an effective program it was essential then, that administrative and technical procedures be established to offset these limitations. The Authority has undertaken cooperative work with representatives of the League of Oregon Cities to assemble information that will be of assistance to municipalities preparing air pollution control ordinances, and also adopted the following policies to encourage adequate air pollution control within Oregon cities:

1. To preserve and encourage local autonomy on matters of air pollution control to the extent that cities would be expected to carry on local programs with such technical assistance and advice from the Air Pollution Authority, as may be necessary.

2. Cooperate with cities in the furtherance of local air pollution control programs.

3. Collect and disseminate information to cities on the prevention and control of air pollution.

The use of the State Board of Health's District Sanitary Engineers, located throughout the State, reduced the amount of travel required by the Authority's technical staff and brought about preliminary investigation of local problems with a minimum of delay. It has also permitted an increase in the amount of air sampling that could be carried on away from the central office. These engineers were given an orientation and training course on air pollution control, sampling techniques, and policy, prior to their use on this program.

The administrative experience secured in the operation of a water pollution control program for more than 16 years was of great assistance in gaining acceptance for the air pollution program. In both programs, the fundamental approach has been to encourage cooperative actions in order to correct undesirable conditions and to prevent the creation of new problems. The method used in developing the confidence of municipal officials, industrial managements, and other interested groups, is just as applicable in the control of air pollution as it is to the control of water pollution. The use of the State Board of Health Occupational Health Laboratory was obtained, which avoided expensive duplicate laboratory facilities. Some of the analyses of samples collected on investigations of complaints and in area studies, require the use of equipment not available in our laboratories. In these cases, assistance has been secured from the Robert A. Taft Sanitary Engineering Center. The Authority's staff has also made maximum use of the local weather data available from the U. S. Weather Bureau.

In order to prevent new air pollution conditions, the Authority's staff has developed a liaison with the county planning and zoning commissions. Arrangements were made so that all requests for construction permits involving possible air pollution problems were referred to the Authority's staff for review before a permit is granted.

During the first few months of the program, it was found that manually controlled sampling equipment consumed too much staff time for the number of samples obtained. Frequently the samples secured lost their value because of a complete change in weather conditions during the sample period. Equipment was designed and built by staff members to meet these conditions and to permit automatic sampling periods at pre-selected times, and to limit the operation of samplers to a pre-selected arc of wind direction. These units greatly increased the number and evaluation of the air sample data. Where complaints involving damage to agricultural crops are encountered, assistance is secured from the state college on evaluation of the problem and on field investigations, if required.

Investigation of Air Pollution Complaints

A major part of the program has been involved with the study and correction of local air pollution complaints. Since the Authority has received far more complaints than could be routinely investigated by its staff, several administrative and technical policies were adopted to limit the investigation to legitimate complaints as follows:

1. That complaints be made in writing, either by letter or petition, explaining the basis for complaint, frequency, length of time the condition has been present.

2. That complaints affecting many people in the community should include signatures of a reasonable number of residents.

3. That if the source of the complaint is within the geographical limits of a city, the complaint will be referred to the City Council for action, with the understanding that advice and assistance of the Air Pollution Authority is available in response to their request.

4. That complaints involving situations that should be handled by other departments such as the County Health Department or County Commissioners will be referred to those agencies, also with the understanding that the Authority will provide advice and assistance in defining the air pollution aspects of the complaint if a request is received.

5. That all sources of air pollution originating outside municipal boundaries are of direct concern of the Authority since there is no enabling legislation in the State allowing the county government to engage in air pollution control activities.

6. That field investigations by the Authority's staff will be concentrated upon measuring the effects of an air contaminant in the vicinity of the source, instead of the measurement of the emission at the point of discharge.

7. That when data describing a stack discharge is needed, the Authority will request this information from the responsible person and will outline sampling conditions so that representative data is obtained.

The investigation of each complaint is conducted under general procedures as follows:

1. Preliminary observations are made to determine the validity of the complaint.

2. Plans are made for the initial sampling to determine the data needed to define the conditions.

3. Conferences are held with the persons or companies allegedly causing the nuisance condition.

4. Air sampling is expanded or increased to assemble sufficient information so that acceptable recommendations for control may be developed.

5. Recommendations for control are developed with persons responsible for the source so that economic factors, owners submitting plans, etc., can be considered.

6. If satisfactory progress toward control is not made by the responsible party, a public hearing is scheduled.

The experiences on a few specific complaint investigations will show how the operations are carried on. One of the first complaints received concerned nuisance conditions produced by cinder and fly ash deposition in the city of North Bend which is located approximately 215 miles southwest of Portland and 5 miles inland from the Pacific Ocean. The population of North Bend is approximately 6,000, and its principal industry is lumber, wood products, and shipping. For many years a nuisance condition caused by the fallout of particulate matter, mostly from the emissions of steam generating plants burning hog-fuel and waste wood burners, had existed in residential and business sections of the city.

In 1950, a large lumber mill was constructed in North Bend which added another steam generating plant consisting of two 70,000 pound per hour units. No cinder and fly ash control equipment was provided other than the cinder return system within the boiler. When the mill began operation the additional cinder and fly ash from the new plant caused the deposition problem to increase appreciably and cause severe nuisance conditions. The North Bend City Council had appointed a local committee to investigate the problem and arrange for a cooperative solution, but after over a year of effort, no substantial improvements had been made.

A petition containing over 1,200 signatures was submitted jointly to the City Council and the Air Pollution Authority and demanded immediate abatement of the nuisance conditions caused by the excessive cinder and fly ash deposition. Preliminary investigations by the Authority's staff showed the major sources to be four lumber and wood products plants located within a mile of each other along the east city limits.

Nine fallout stations were established at representative locations in the city and the data secured showed clearly that a severe deposition problem existed in certain areas. The fallout rate in the most critical area exceeded 1,700 tons per square mile per month. Conferences with the managements of the four mills concerned, disclosed general agreement that there was a problem and that each company would proceed with the correction of that part of the problem caused by their plant discharges. The next step in the complaint investigation was to determine the characteristics of the prevailing wind, since the fallout data indicated that the periods of heaviest cinder deposition occurred when the wind was from the southeasterly direction, which carried the objectionable materials directly over the business and residential sections. A compass rose showing wind direction characteristics during winter and summer, and variations in wind direction during a year's sampling, was prepared from weather data obtained from the local airport. Correlation of this data with information on fallout patterns produced evidence showing roughly the areas of the city affected by each mill. Before an evaluation of the approximate percentage of the fallout originating from the individual mills could be made, it was necessary to secure stack measurements from the four steam plants. The management of each mill retained consultants to make the study and prepare reports. From both staff studies and information obtained by the mills, it was possible to calculate the hypothetical deposition at various points downwind from each mill. The information secured clearly showed that the North Bend area most seriously affected by the cinder depositions which originated from the new mill's steam plant, and to a lesser degree from the central power station of the local electric utility. Since the power company had installed a partial control system a few years earlier, and the plant was further away from the problem area, it was evident that correction should be made first at the lumber mill.

The Authority's study extended over a period of a year and a half and every effort was made to keep the community and the industries advised of the preliminary results obtained during the sampling. About this time the management of the new mill requested a conference with the technical staff to review the data available since it was their intention to proceed with the installation of necessary cinder control devices if the need was shown. As a result of these discussions the company submitted plans for the installation of two multiclone type cinder collector units that were later installed at a cost of about $110,000.

The Authority continued to operate five of the sampling stations to determine what reduction in fallout had been brought about by control measures. During the first period of sampling after the control system was installed at the new mill, the fallout rate of 1,700 was reduced to 34 tons per square mile per month, and this reduction continued during subsequent periods. The residents in the community were extremely pleased with the elimination of what had become a severe public nuisance. When the technical staff began their study, the feeling in the community was extreme, with the usual accusations that the mill managements were indifferent toward the cinder problem and that nothing would be done. When corrections eventually were made in the severe area, the most active complainants who circulated the petition were so satisfied with the results obtained, that they were quick to commend the management for their interest. Two other mills in the area have now also taken steps to reduce the discharge from their plants.

Another complaint involved the emission from a cement plant in Oswego, a city of approximately 3,500 population, located about 8 miles south of Portland. Many years ago the area around this city had been promoted for industrial development, and it was during that time that the cement plant was constructed in the community. But the town developed more and more into a primary residential community and, naturally, the cement dust discharged by the plant became a more frequent cause for complaints. The original capacity of this plant was approximately 70 barrels of cement per hour, but in 1947 the plant doubled capacity and spent about $260,000 to install an electrostatic precipitator to remove dust from the main stack, and 4 bag collectors to remove dust from the production process.

In spite of these installations, complaints continued to be made to the city officials, and when the Authority started field operations in 1952, a letter was on file from the City Council in which they requested an investigation of the problem and such assistance as the Authority could render to bring about additional control measure by the industry. The field investigation was begun with the location of six fallout stations in representative areas in the City of Oswego. A comparison of the results obtained in the Oswego stations showed that the total particle fallout was from two to three times heavier than would be expected in communities where no unusual source exists. The plan was to use the calcium content collected in the samples as a tracer to determine how much of the area fallout originated from the cement plant. Fortunately, there were no other major industrial lime (calcium oxide) users in the vicinity. Use of calcium as a tracer showed that 45 to 80 percent of the dust collected was cement. This relatively simple sampling technique proved that a serious deposition problem existed, but the length (one to two months) of the sampling period was too long to make a determination of the degree of additional dust control equipment that was needed at the plant.

The next step in the sampling procedure was to locate high volume air sampling equipment which operates about 60 cubic feet of air per minute at 3 of the particle fallout stations. A type S pleated filter, manufactured by the Mine Safety Appliance Company, was used, and filters were changed at the end of each 24 hours. At one of the stations an electrostatic precipitator unit was also operated concurrently to collect a sample to determine the percentage of particulate matter that was cement dust. The data obtained showed a wide range in concentrations of particulate matter during the same sampling period, depending upon wind direction and distance from the plant. However, the 24 hour sampling period was again too long, and the wind direction too changeable to formulate recommendations for dust control. It appeared essential that the operation of sampling equipment should be limited to a pre-selected arc of wind direction at each of the 3 stations. Unfortunately no such equipment could be purchased, but after a number of trial and error attempts, such a unit was made, consisting of a wind vane connected to cam operated micro switches. A magnetic dampening system was necessary to prevent the vane from spinning during changeable winds. Using the wind vane direction switch, it was possible to locate 2 high volume units at the same sampling station, and connect 1 of the samplers to operate when the wind was from a 60° arc from the plant to the station, and to operate the other sampler when the wind was from the remaining 300°. Thus, it was possible to compare the dust load of the air coming from any selected direction with that coming from the remaining directions. This equipment was operated at the 3 representative sampling points with rather consistent results. Winds from the direction of the cement plant carried 2 to 3 times the dust concentration found in the other directions toward the plant. Chemical analyses of this dust showed it to contain from 45 to 80 percent cement.

There is a lack of data regarding what the concentration of cement dust might be expected to be a problem in the residential and business sections of a community. It was essential then, that information be secured showing what concentration caused a problem in Oswego. A survey was made of the fringe area to locate a sampling station where most of the residents were not aware of any nuisance condition. Such a station was established about one mile northeast of the plant, and the sampling procedure was followed. After several continuous sampling runs, data was obtained and an evaluation could be made. It was found that, based on the Authority's data, a reduction of approximately 80 percent was needed in order to remove the nuisance conditions in affected areas.

During the time the staff investigation was being made, all results obtained were provided to the company and to the city, with the understanding that the information was preliminary. During regular meetings of the Air Pollution Authority, progress reports were presented, and representatives of the city and the cement company were also heard.

During the field survey, the cement plant management had started investigation of what additional dust control could be provided, and arrangements were made for a study of the discharge from the main stack. Plant personnel also started routine stack sampling. While the Authority's staff was evaluating the field data, the company provided the results of over 75 stack measurements. After several conferences between the company representatives and the Authority's technical staff, it developed that an overall collection efficiency of 99.5 percent would be required to remove nuisance conditions. At this time, the plant management was seriously considering an expansion, so it was necessary that the additions made to the dust control system take care of the present problem, and in addition, prevent dust discharge from a new kiln which was proposed. The plant is proceeding with the installation of 2 additional electrostatic precipitator units that will have an overall efficiency of 99.5 percent. This project will be completed in April of 1956 at a cost of about $385,000.

Complaints Where The Air Pollution Authority Recommendations Are Not Followed

During a period of three years of operation there have been a few cases where the persons responsible for sources of air pollution have not provided improvements after receiving recommendations from the Authority. The first case involved a burning refuse dump, just north of the city limits of Portland. The odor and fly ash from the open burning had caused odor and deposition nuisances for many years. The Authority made recommendations expected to reduce these nuisance conditions. However, the owner continued operations in the usual manner. A public hearing was scheduled before the members of the Authority, and after hearing all evidence on both sides of the matter, an order was entered requiring the operator to cease all burning until proper combustion facilities were provided. The owner closed the dump.

Another case involving official Authority action, concerned dust and fumes discharged from a portable asphalt plant in the southern part of the state. The paving plant was located a few hundred feet from residential and motel properties, and no dust control system had been provided. Recommendations were given to the plant owner to install temporary dust control facilities. No action was taken, and the Authority held a special meeting and decided to proceed under the summary abatement provisions of the statute. An injunction was secured by the State's Attorney General through the local Circuit Court. However, the paving plant owner succeeded in having the effective date of the injunction postponed, but in the meantime, however, he secured the services of an engineer and installed temporary dust control which satisfied the complainants.

Municipal Actions to Establish Air Pollution Control

It became increasingly evident that a small State agency cannot handle the detailed complaint investigations required within the city boundaries to bring about control. It is essential then in Oregon, if the objectives of the State Act are to be realized, that local legislation be enacted. There has been a continuing effort to generate interest among city officials to establish such a program before serious area problems exist. In the City of Portland there are over 100 local situations which have been the subject of complaint, but at the same time, there has not been general appreciation that area problems exist during inversion periods.

The actions of the Air Pollution Authority have demonstrated improvements can be made in almost every complaint situation, but it is equally true that the major part of the control needed in Oregon communities must be brought about by cooperative effort of the entire community, not just the industrial part. It would be inefficient and ineffective for a State agency to create a large enough organization to control the thousands of individual sources of existing and potential air pollution in even a medium sized city . The State agency can be effective by providing technical advice and assistance.

Since 1941, the City of Portland has had an ordinance establishing a local Air Pollution Committee. However, active efforts by this committee were not started until 1949, and after several years'study, a proposed ordinance was drafted and a public hearing held in October 1953. Due to opposition from various industrial groups, the matter was tabled. The City Air Pollution Committee meets regularly, however, to continue its study.

Earlier this year, the Portland City Club, after almost a year's investigation of the air pollution condition in Portland, published a report and urged the early adoption of an appropriate city ordinance.

In the meantime, there has been an increasing number of complaints referred by the Authority to the City of Portland for action. About a year ago, the city provided a part time inspector from the Bureau of Health to investigate air pollution complaints. Joint investigations with the city are being made, and recommendations for control are submitted to the Bureau of Health.

The City of Eugene is making progress toward a start on a local program. Recently, the City Council directed its attorney to prepare an ordinance, and the city, assisted by the Authority, has expanded its air sampling operations so that basic data will be available on which to establish the ordinance provisions.

The Authority recognizes that the provisions contained in a city ordinance limiting the discharge of air contaminants necessary must be specific limitations, but also general in their application within the city. It is not practical for a municipality to study each source as an individual problem due to the proximity of one plant to another.

Several cases have been found within the State, where a number of sources within a small area were in substantial conformance with the provisions contained in the 1949 American Society of Mechanical Engineers code provisions limiting particulate matter discharge. However, there still was an area nuisance problem. Therefore, the ordinance provisions must also include area objectives that will require sufficient control to prevent atmospheric contamination.

There is increasing interest shown by city officials and others in several cities of the State. It appears that, as local problems become more evident and demands for corrections more insistent, arrangements will be made to provide for local activity on air pollution control. It has already been pointed out that cities with a population of less than 10,000 cannot be expected to provide adequate personnel to staff such programs; and such work will probably become a part time duty of some city employee. It is essential, however, that the maximum local activity be developed, for satisfactory control will not be achieved by regulating only the industrial part of the community. In the long run, the program must also promote efforts on the part of the individual citizens and the commerical part of the community.

Area Studies

As the cities proceed toward establishing a local control program, the need is created for data describing the present situation. Satisfying this need is one of the main objectives for conducting area atmospheric pollution investigations. The other major objective is to assemble basic information that will be useful when it becomes possible to adopt regional standards limiting the concentration of various air contaminants. This part of the Authority's program has been delayed due to the insistent demands to investigate individual complaint conditions. Except for the particle fallout studies, most of the area investigations have been carried on in the Portland vicinity. This work has included the collection of several hundred filter samples at area stations. In addition, sulfur dioxide, fluoride, oxidant, carbon monoxide, and oxides of nitrogen measurements have been obtained. Plans were made to extend the area studies to three medium sized cities starting in the fall of 1957.

Two areas in the Portland vicinity have been involved with the agricultural and livestock fluoride effects. Both areas are near aluminum reduction plants that started operation in the early 1940's. Since 1947, several hundred thousand dollars have been spent by the State, industries, and complainants on agricultural and veterinarian field investigations to determine the extent of the problem. Even after control systems were installed at the aluminum plants, additional investigations have been made to determine if the fluoride damage had ceased. In the Sauvie Island area, the agricultural studies made since the fluoride control system was installed at the aluminum plant, show that no livestock injury is occurring. In the other case, litigation of several suits is continuing and the determination will be made in court.

In 1953, complaints were received by the Authority relative to continuing agricultural and and livestock damage, and since that time, the staff has collected several hundred fluoride air samples as a check upon present conditions. It is unfortunate that air sampling was not carried on concurrently when the original agriculture and veterinary investigations were made. Plans are being formulated, however, to carry on present sampling work to correlate later with the fluoride concentrations found in pasture grass. This type of investigation involves plant horticulturists, veterinarians, and other specialists beyond the resources of the Air Pollution Authority, and will require outside assistance.

Several area investigations have been made in connection with the proposed construction of new industrial plants. Data was secured in advance of the plant construction in order to establish the values prior to the plant operation.

Again it should be pointed out, that the sampling equipment available could not be used by the Authority's staff to conduct these area studies. It is true that automatic recording sampling units have recently been developed. However, these units sell for approximately $4,000 each, and most units are not easily moved, or serviced. For instance, in the collection of the fluoride samples, a few sampling runs were made, using several manually controlled Smith-Greenberg impingers connected to a vacuum pump to secure samples concurrently from area stations. It became an impossible task to collect a reasonable number of samples with the available staff. The Wilson Automatic Impinger was modified so that 24 samples could be collected continuously; 1 sample being obtained in the daytime, and 1 at night. In this manner a 12 day sampling run was obtained at each station that required only 3 field trips. The staff has designed an automatic impinger that includes an adjustable sampling cycle of two, four, six, or eight hour periods. Twenty-four continuous samples can also be secured, using one of four pre-selected sampling periods.

Frequently it has been necessary to run air sampling equipment at night or on weekends. Program clocks were modified so that sampling equipment could be turned on and off automatically. At times, continuous sampling is required, and in order to eliminate the need for a staff member to service the equipment, repeat cycle timers were assembled.

Recommendations

It is hoped that other States, undertaking air pollution control programs in the future, will not experience undue delay securing personnel and developing sample and analytical procedures adaptable in their States. The following recommendations, based on the Oregon experience, are submitted for consideration:

1. That the Public Health Service provide training for technical personnel needed to staff air pollution agencies.

2. That the Public Health Service promote regional training and orientation meetings, for personnel engaged in control activities, on the application of new analytical and control methods.

3. That sufficient research be undertaken to define the nature and concentrations of contaminants that cause health effects in the general population from 24 hour exposure in the outside atmosphere.

4. That the effort be increased to define the property damage and other public nuisance conditions resulting from air pollution, including damage to agriculture and livestock.

5. That portable sampling equipment, suitable for outside use, be developed which can be operated with a reasonable amount of servicing, and that can be purchased at a price that is not prohibitive.

6. That increased effort be made to produce standard sampling and analytical techniques.

In Oregon, three years' experience with a State air pollution control program has shown that results can be produced by a cooperative approach. During the three year period, over two million dollars has been spent to correct or prevent air pollution nuisances. It is acknowledged that the administration of the program involves complex relationships with Federal, State, and local governmental agencies, adjacent states, industrial groups, and others. Although only a start has been made toward accomplishing the objectives of the Oregon statute, we are confident that air pollution can and will be reasonably controlled, just as other environmental problems have been solved, by intensive cooperative effort.

CAMERON: Do Portland and some of your other cities have their own local ordinances?

EVERTS: Portland has a smoke ordinance, but they have not adopted an air pollution control ordinance as yet. I believe that they are approaching the time when an ordinance governing air pollution control will be submitted to the city for consideration.

PICKARD: I would like to ask whether the employees of the Air Pollution Board are employees of the State Department of Health.

EVERTS: They are employees of the State Department of Health. In my haste to get through, I was unable to mention some of these things. The Air Pollution Authority was created as a division of the State Board of Health, but has been granted powers which are supplemental, and in addition to those granted to the Board of Health under the general health laws. The State Board of Health employs, recruits employees, and services the personnel. The policies on air pollution control are established by the State Air Pollution Authority. The personnel for air pollution contról operate as staff members of the Division of Sanitation and Engineering.

W. J. SCOTT: In your younger personnel, do you have both sanitary and mechanical engineers?

EVERTS: At the present time the head of the section is a sanitary engineer. His assistant is an engineer who graduated originally in Civil Engineering, with a Sanitary Engineering major; he later took advance work, getting his Master's degree in sanitary engineering. He spent several years at the University of California, received his Civil Engineering degree in Sanitary Engineering, but during that time a great deal of his work was on air pollution control activities. The other engineers that we've employed are district sanitary engineers from the State Board of Health, who have received as much training as we've been able to afford them on air pollution control work. In addition, we have two chemists, one of whom we borrowed from our Occupational Health group. The other one is a chemist who was formerly employed by Stanford Research Institute on Air Pollution Control activities.

BALLMAN: You made some reference to the fact that the one problem was not specifically a health problem. You also went through the preamble of your statute pertaining to nuisances - city ordinances are based on nuisances. What is the Health Department's attitude regarding nuisances and the enforcement of nuisance statutes?

EVERTS: Actually the Board of Health, as such, has very little to do with the policies or attitudes that have developed. The State Air Pollution Authority, which is a separate board, develops the policies, and we have only had one or two complaints in which it was alleged that human injury had occurred. As a matter of fact, I mentioned one in which people have already been awarded damages. We did not get involved in any of the investigations there, although some of our data was subpoenaed for presentation in the case. There is another suit now under trial in the Springfield-Eugene area, in which people are alleging personal injuries suffered from inhalation of emissions from a Kraft pulp mill. I don't believe that a decision has been made on that case yet. But where such cases have entered the courts, we have tried to stay out of them so that we don't get involved. We usually get involved anyway, without trying. The Air Pollution Authority is responsible under the present law for investigating any complaints in which it is alleged that human injury has occurred. We do not have any physicians on our staff, but we do use physicians from the State Board of Health in case they are required.

FLANAGAN: I think Mr. Everts brought out several points that will be very helpful to certain individuals engaged on a similar level of activity in other sections of the country, and of course, I'm sure that the implication of personal injury award regarding the ingestion of fluorides, is not lost on this group. It will have tremendous significance throughout the country if it is upheld.

Apropos of your recommendations, Mr. Everts, which we're very happy to have, I think you may recall, as Mr. Stern announced yesterday, that we are planning training courses and that the field training courses probably will be given during the 1957 fiscal year, but not during this year.

The next speaker will talk on Typical Legislative Provisions. I'd like to present Mr. J. S. Sharrah, Assistant Director, Bureau of Industrial Hygiene, Pennsylvania Department of Health, from Harrisburg.

Typical Legislative Provisions

Jacob S. Sharrah

To understand fully the State's roll in air pollution and the provisions that are typical to overcome the problems arising from air pollution, it might be wise to trace the development of State legislation by examining some of the past cases which have been tested by court decisions.

In the case of the State of New York versus Tower, a law stating that cities of 100,000 population or over have the power to declare dense smoke emitted within the city limits to be a public nuisance, was held to be valid and reasonable. In fact, the court noted that it was entirely competent for the legislature to declare the emission of dense smoke in the open air in a city of 100,000 inhabitants a nuisance, per se.

However, before this New York case, a case of the State of Minnesota versus the Sheriff of Ramsey County, Minnesota, in 1892, held that a law declaring the emission of dense smoke within the City of St. Paul to be a nuisance, except manufacturing establishments using the entire product of combustion and the heat power and light produced thereby within the building wherein the same are generated, or within a radius of 300 feet, was untenable.

In Massachusetts in 1910, there was an air pollution law enacted that created a smoke control law for the City of Boston, which was adopted by many of the surrounding municipalities, which was under the supervision of the Massachusetts Department of Public Utilities.

In Pennsylvania, a Model Smoke Control Ordinance was published by the Engineering Division of the Department of Health, and was recommended to third class cities under an enabling act of June 6, 1911. At a later date, the Division of Sanitation of the Department of Health published a Model Nuisance Ordinance which was enforceable by any community which adopted it, or by the State itself, through the General Health Law. This ordinance practically controlled anything which we may now term air pollution, and provided for the enforcement of the law. However, after a few attempts in court, it was established to be very difficult, at that time, to brand air pollution a nuisance, as the ordinance actually had no teeth.

From these early starts, as well as many others, air pollution control grew to the status in which it rests today. The public is more informed on air pollution and is less inclined to suffer from the annoyances resulting from pollution.

Many cities had started some program of air pollution control, but few States had become interested, or if they were, could not sell this interest to their Commissioners or Secretaries of Health; in fact, this is still very true. However, with the Donora incident and the growing Los Angeles problem, the renaissance in air pollution, particularly at the State level, began.

Various Bureaus of Industrial Hygiene, already aware of the problem, had, to some extent, been doing air pollution control work, and this was extended, as in Pennsylvania, where divisions were set up within the Industrial Hygiene Bureau.

Laws of all kinds and descriptions began to appear on the horizon of many States, and for a short time, the doom predictors, self-styled "fathers of air pollution control", and armchair experts held full sway.

However, as usual, rationalization returned and some of the States considered passing air pollution enabling acts or control laws.

Two States passed enabling acts, California in 1947 and Kentucky in 1952. The California law established districts, and the county supervisors may establish working air pollution control units. The Kentucky law is similar in nature and also establishes districts in which control agencies could be initiated.

Three other States, Oregon, Massachusetts, and New Jersey, have laws establishing control agencies in the State government. Of these three, the control agency is placed in the State Health Department in Oregon and New Jersey, but in Massachusetts, while the authority and responsibility is placed on the Health Department, there is no specific agency to handle the work. Actually though, with the transference of the smoke inspection from the public utilities department to the Sanitary Engineer Division, this agency will assume control.

The State of Washington had a State, University of Washington, and industry quasi-control agency established in 1951, but this recently terminated its free service to communities due to the cessation of funds from the State government. This agency, housed at the University of Washington, conducted a number of air pollution studies on a fee basis, and while using State funds, was organized with the Director of the Washington Pollution Control Committee as the State official cognizant of air pollution activities and the unit at the college acting as technical consultant.

Perhaps the best way to consider the typical legislative provision is to consider the problems of a State and what provisions have been made in the enabling laws to overcome these problems and/or how they may be solved.

First, it must be emphasized that air pollution is strictly a localized problem, usually unique to a certain district or area. Therefore, it is believed that the first step to solving the total problem of air pollution is an enabling act.

The Enabling Act

The enabling act should be just what the name implies and nothing more. It may include only those sections that would define its purpose and establish the agency, prescribing its powers, functions, and duties.

The following sections may be considered in any enabling act:

1. Purpose of the act: This is, of course, fundamental and is a necessary part of any act and is found in all the existing acts.

2. Definitions: It is of the utmost importance that this section be included in order to clearly define the intent of the act and to eliminate equivocation. Even though any regulating acts subsequently passed must also have definitions, it is necessary to define the terms used in the enabling act itself. All the States which already have laws have done this in some manner, but some are more readily referred to than others. A clear, concise, and unequivocal definition for the terms used is a must in proposed air pollution legislation.

3. There may be a section to establish an agency or responsibility at the State level. In Massachusetts, New Jersey, and Oregon this is established within the Department of Health, but the agency is not limited to problems of the physiological effects on people. In California and Kentucky there is no State agency;

> the act being an enabling act in its purest form. The membership of the air pollution agency may be delineated and its personnel stipulated. In some States there are included men like the Commissioners of Health, Labor, and Agriculture; citizens; and members of interested organizations and associations, both professional and business. From a standpoint of efficiency, this Board should be small, but from the standpoint of representation, it should be large. This difficulty may be solved by having a large advisory board and a small operating board. It is debatable and good points can be brought up from all sides on the membership of this agency, but it is believed that representatives of those interested should be considered as well as technical knowledge since it is easy to employ the latter.

Qualifications for the individual selected may be included if they are not to be chosen from the various existing agencies and interested associations.

The enabling act may also include the powers of the Board or Agency, completely and concisely delineated within the intent of the act. The three existing State laws give the agency responsible for air pollution control, the power to promulgate rules and regulations aiming at the abatement of air pollution. From a practical standpoint, the facts that rules and regulations are usually controversial and are also subject to change for many reasons, make it advisable to include them in the powers rather than in the act itself. It can easily be seen that to keep controversial features out of the original act will tend to keep that act further from criticism by the various interests.

The right of inspection, to carry on research, to conduct educational programs, and to require registration of sources of effluents are typical provisions for this section.

Organization of the local areas is one of the most controversial problems. First, as is the custom in all new laws, existing laws at the local level are usually not changed. However, the difference of opinion arises from the extent of the local jurisdictions. Shall it be made county or multi-county, city or town, or perhaps by township? Air pollution is not a respecter of political boundaries, and it is difficult to delineate control areas. One suggestion has been for a State to set up control areas based on industry, topography, and prevailing weather similarity. This would seem advisable from a technical standpoint, but might be extremely difficult to administer. Some suggested laws in Pennsylvania have contained provisions where the duties of the State control agency are to establish these areas and determine minimal requirements for those areas that do not already have local air pollution agencies.

Of course, there is always the outline of procedures for dealing with violators. All the existing laws have these provisions which are usually the hearing, fine, appeal type of regulations. In many of the suggested laws where a State agency has been given the power to promulgate regulations, an appeal to the State agency from the local agency is allowed.

In the three existing laws, the dealings between the State agency and the local, is outlined as to procedure for most of their relationship such as consulting, cooperation, and advice. In Massachusetts, the State can assume part jurisdiction in dealing in a local dispute between two control agencies.

In summary, it should be emphasized that the first step is an enabling act, giving a basis for the establishment of the local agencies, and then this basis may be expanded to take in the establishment of any State agency.

Rules, regulations, and other features are better developed by a power of promulgation rather than by being stated in the law itself.

FLANAGAN: I was rather intrigued by the idea of avoiding political boundaries, but Mr. Sharrah recognized the problem of administration too as he went along with his comments.

The next series of three papers, the first on State-municipal relations, the second on State-interagency relations, and the final paper on State-Federal relations, probably will have a common theme. At this time, I take great pleasure in introducing Mr. John C. Collins, Senior Chemist from the Division of Sanitary Engineering, Massachusetts Department of Public Health, from Boston, Massachusetts, who will speak to us on State-municipal relations.

State-Municipal Relations

John C. Collins

Last year the Massachusetts General Court enacted a new comprehensive air pollution control law, making Massachusetts one of the few States having an air pollution control law with enforcement at the State level.

Since our relationship with the municipalities is governed by the law and our interpretation of the law, I believe a discussion of our new air pollution law, and a brief review of existing statutes relative to the matter, are in order at this time.

There were three statutory groups of laws before enactment of the new law under which problems in air pollution, in some cases, may have been controlled.

The first group is the Nuisance laws, which, in the State of Massachusetts require local boards of health to examine into all sources of nuisances and sickness within their jurisdiction. The local boards may require abatement of such nuisances as, in their opinion, are injurious to the public health. In cases where local boards of health refuse, or do not act to abate the nuisance, appeal is made to the County Commissioner and not the State Health Department. If the County Commissioners decide to hold a hearing relative to a nuisance complaint, and decide that action should be taken, they may assume all power of the local board of health. However, the complainant must pay the expenses incurred by the Commissioners, but they may be reassessed against the defendent, if conditions warrant it.

The second group is the Noisome Trade laws. These laws provide that any trade which may result in a nuisance or be harmful to the inhabitants, dangerous to the public health, or attended by noisome or injurious odors may be established only in an area assigned by the local board of health. The local board of health may revoke the assignment at any time they think proper. The State Health Department has jurisdiction in the assignment of noisome trades, in that any person aggrieved by the assignment may appeal to the Department for a hearing. After such a hearing, the Department may rescind, modify, or amend the assignment of the local board of health. Under this law, the Department's only recourse is to order a trade or occupation to desist from further operation, and allows for no other recourse.

The third group of laws which deals with air pollution, is the Smoke Abatement laws. The Legislature established, in 1910, a Division of Smoke Inspection for the Boston area in the State Department of Public Utilities. The smoke district originally consisted of 6 cities in the Boston area, but has now grown to include 31 cities and towns in the greater Boston area. This law classifies all stacks according to their diameter, and regulates the density and time of emission of visible smoke, based upon the Ringelmann Chart and the class of stack.

Under the new air pollution law, the Division of Smoke Inspection has been transferred to the Department of Public Health; however, its duties and functions remain the same, i.e., regulation of visible smoke emissions within the Greater Boston Smoke District.

Up to the time of passage of the new air pollution law, cities and towns outside the Boston Smoke District may have accepted a portion of the general laws dealing with smoke abatement. This law states that the emission into the open air of dark smoke or dense gray smoke for more than 5 minutes continuously, or the emission during 90 minutes of any continuous period of 12 hours, within a quarter of a mile of a dwelling, is declared a nuisance. Since no standard is used to determine the density of the smoke, enforcement of this law is almost impossible. The new air pollution law repealed these sections of the law dealing with smoke abatement with the exception of three municipalities which had special legislative acts dealing with the smoke problem in their respective communities. Again, these laws did not provide a standard for smoke density, and therefore, enforcement has not resulted.

In addition, under the then existing laws, air pollution problems resulting from one municipality and affecting another, could not be controlled without resorting to court action, unless the community where the nuisance originated were to take action.

It is quite evident that these laws were not conducive to an effective air pollution control program. Due to the inadequacy of this legislation to control pollution of the atmosphere, the Joint Legislative Committee on Public Health directed the State Health Department to draft a comprehensive air pollution control law which would place the field of air pollution under the jurisdiction of the State Health Department.

The resultant law, under which the State now acts in the control of air pollution, is known as Chapter 672 of the Acts of 1954, and has been in effect since September 7, 1954.

Under this law, air pollution includes, but is not limited to, the emission of smoke, particulate matter, soot, cinders, ashes, toxic and radioactive substances, fumes, vapors, gases, industrial odors and dusts, which constitutes a nuisance, a danger to the public health, or impairs the public comfort and convenience.

The law can be briefly summarized by saying that the State Department of Public Health is authorized to establish minimum rules and regulations to prevent and control air pollution within the State. These rules are formulated after a public hearing, and when approved by the Governor and Council, have the force of law. Fines of not less than $10 nor more than $50 may be assessed for the first offense, and not less than $20 nor more than $100 for each succeeding offense. The court may restrain the use or occupation of the premises until the rules and regulations have been complied with.

The local board of health or other legal authority constituted for such purpose, has the authority to regulate and control air pollution, and may adopt and enforce reasonable rules and regulations for the control of air pollution, subject to the approval of the State Department of Public Health.

The State Department of Public Health, upon request of a board of health of a town adversely affected by air pollution arising in another town, can act, after a public hearing, to correct the objectionable conditions by assuming joint jurisdiction to regulate and control the causes, and may exercise all powers of the local board of health under the provisions of the general laws.

Unfortunately, the last session of the Legislature appropriated no money for personnel or equipment, with which to enforce the provisions of the law, and to draft suitable rules and regulations. We have hopes that the present session will allocate money toward this end.

Our most urgent problem, at the present time, is the drafting of rules and regulations. This past year the Department has received numerous requests from cities and towns for such rules and regulations. To date, it has been impossible to comply with such requests because of lack of personnel and equipment. Nevertheless, the Department feels, that adoption of blanket rules and regulations would be of no value, in view of the fact that the atmospheric pollution of each localized area is unique, being dependent upon the air-borne waste discharged in the area, and the atmospheric dispersion capabilities of the area. Drafting suitable rules and regulations that would take these two parameters into account requires a survey of each localized area by trained personnel. This approach would, initially, run into a great deal of expense, which we believe should be paid by the area requesting such a survey. Besides insuring the drafting of suitable rules and regulations for the area, it would also tend to stimulate local interest in the matter. This latter point is important because it is essential that the rules and regulations are not punitive. Although we all desire good clean air, we must at all times consider that each community is limited to what it can afford to pay for the clean air.

Now, although we in Massachusetts have been in the unenviable position of having the will but lacking the substance, we have not chosen a course of watchful wating. We have, over the past year, started in one community an initial survey of the extent and source of its air pollution. This program, although limited, we shall carry on for a minimum of one year, or until such time as we feel that we have enough factual information.

As a result of a hearing, the first under the provisions of the new law, which was petitioned for by one community against the offending community, we have initiated a sampling program to determine the extent of the pollution. In this particular case, we feel that we have effectively solved the problem. However, the program will continue until enough information is gathered to show, to the mutual satisfaction of the aggrieved community, that the condition has been abated.

In addition to these large area porblems, we have been regularly called upon for techaical advice by the local health departments to help in solving air pollution problems from point sources.

We have also initiated a course on air pollution for plant officials, engineers, and interested persons. The course is given in a series of lectures covering the law, health aspects, problems and control, and influencing factors in air pollution. One such series has already been given and others will be given within areas being surveyed. The purpose of the course is to gain cooperation on a company-individual level by acquainting them with the problems involved in and the purpose of air pollution control.

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Although our law is young, the relationship we have thus far enjoyed with the 351 municipalities in this Commonwealth, under our new air pollution law, has been one of close cooperation as we pioneer in this new field within the State. Thus, we have every reason to believe that our new law will serve as a secure cornerstone in an expanding program of air pollution control.

FLANAGAN: The next topic is a paper on State-interagency relationships, to be given by Frank M. Stead, Chief of the Division of Environmental Sanitation, California Department of Public Health, in Berkeley, California.

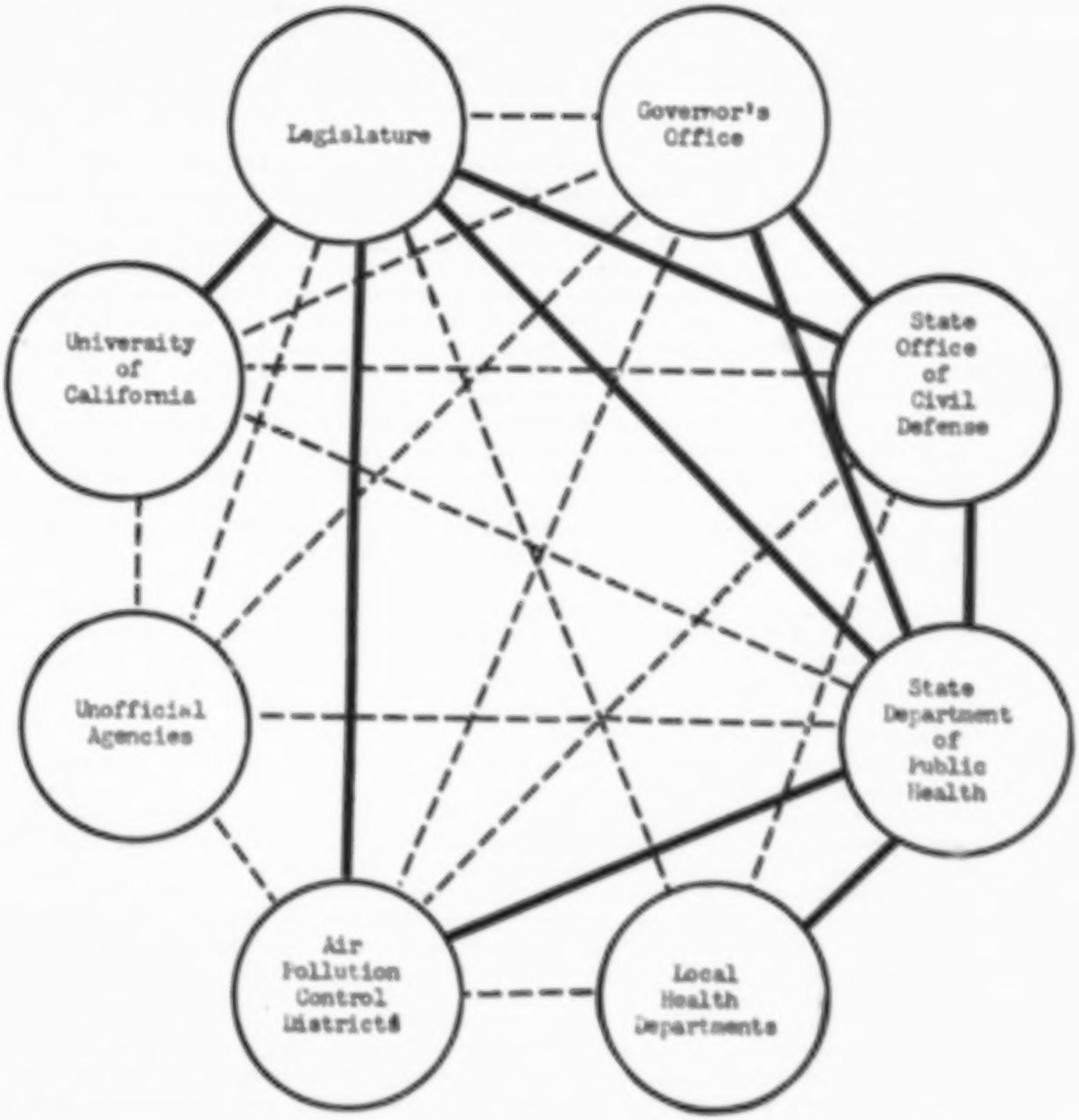
State-Interagency Relationships

Frank M. Stead

I have been impressed by two things: one, I expected, the other I was somewhat surprised at. The first is the diversity of background and attitude in this group; one can discern three parallel streams, one coming from the oldest segment of the air pollution field dealing with smoke abatement, the other two coming from health departments equally at State and Federal levels, one being the specialized interest of industrial hygiene work dealing with indoor air pollution, and the other, the broader background of sanitation which is just beginning to develop an interest in community air. That, of course, was expected. The other somewhat unexpected part is the tremendous difference in attitude toward air pollution in general, and toward the segments thereof. I think you might take note of that wide difference of attitude toward the levels of impairment or the price which a community pays for air pollution, some of us believing that we are only interested in human illness of a rather dramatic sort, perhaps death, other of us believing in a wide variety or spectrum of impairments of human welfare, and still others interested primarily in damage to property, what you might call the non-human values.

There is also a tremendous difference in the attitudes of the various populations which we represent, and rather than have this discussion considered as representing just one population, and therefore having little application to the rest of the country, I ask you to consider that this population represents one end of the spectrum of population interest. I imagine that California has the highest pitch of population interest in all segments of population, and consequently, this very active and dynamic cobweb (See Figure) of relationships between various agencies. First of all, I am going to talk only about the eight types of agency represented, seven of them being official Government agencies and one of them being an unofficial agency: beginning at the top with Legislature, that is, the law-making body; the Governor; the Office of Civil Defense; the State Department of Public Health; local health departments of which there are 75 full time in California, and some 40 or 50 part time; Air Pollution Control Districts, operating under

Nature of Inter-Agency Relationships


Legislature
Governor's Office
University of California
State Office of Civil Defense
Unofficial Agencies
State Department of Public Health
Air Pollution Control Districts
Local Health Departments

Legend:
━━━━━━━━ indicates primary relationship
- - - - - - - - indicates secondary relationship

specific statutes; and the unofficial agencies and the State university, and my opening remarks will be directed to these same groups of agencies.

I ask you to note that even in the face of this high level of public interest, active participation in the air pollution control program is not evidenced by three very obvious absent members of this group, the State Department of Agriculture, the Labor Department, and the Department of Natural Resources, a rather unexpected omission from the network of participating agencies at the moment.

First, briefly, let us try to review the moves, the roles, the responsibilities, the operations, the sphere of action of these eight types of agencies shown on the figure, and then consider the relationships. Legislature, I would like to consider first. Legislature has had on air pollution three functions that have been dramatic. First, there have been very active and fruitful studies by legislative committees. There have been many of these, and the most recent one was a two year interim study by a Joint Assembly Committee on Public Health, Conservation Planning, and Public Works, that terminated in the issuance of four reports. Two that have been the most pertinent I have here, and they are available for display; Number 3, called"Air Pollution Control" is an excellent general exposition of the problem; and the fourth one is called"Air Pollution in The San Francisco Bay Area". These interim studies have had a very real effect on thinking and on the actual enactment of legislation. The other two obvious functions of the Legislature are the enactment of legislation and the appropriation of funds to implement legislation.

Second, the Governor's office. The Governor's office is in a key position in a State where there is a high level of interest. There are three primary activities that the Governor has, that I would call to your attention. The first is the use of his powers under the Disaster Act. In California, the Disaster Act was amended at the last session of the Legislature, to include air pollution as one of the activating justification for declaration of a state of extreme emergency and the use of the almost unlimited powers of the Governor to have mandate over the entire welfare of the community and area-wide living. He has the power to order industry to shut down, to order dramatic changes in transportation patterns, and the like, and enforcement with the use of the State Militia. He utilizes the Office of Civil Defense as the mechanism of implementing the plan. The next two moves that the Governor makes that are of primary importance, in addition to many others that were not mentioned, are the ordering of emergency studies or emergency actions by any of the State departments, and finally the authority of authorizing the use of the Governor's emergency funds to carry out these emergency assignments. Last March the Governor ordered the State Department of Health to make an emergency study of the problem of air pollution in California, and appropriated out of his emergency funds $100,000 for this purpose. The study was terminated, and the first preliminary report, which many of you may have seen, entitled "Clean Air for California", was issued and copies of all of these reports are available from the appropriate source. In addition, he ordered the University of California to engage in what was dramatically called "a crash program of research" to get "the mostest, the quickest" in the way of leads for action. Six projects were undertaken in this same emergency period and continued during the ensueing year, and the University of California has just published its first preliminary report on the six projects in this first crash program of research in air pollution. Copies of any of those reports may be secured from the University of California at Los Angeles, and Dean Boelter is the person most closely responsible for them.

Let's turn now to the Office of Civil Defense. In California as in many States, the Office of Civil Defense has the responsibility for planning for all disasters, natural or man-made. We have used the Office of Civil Defense machinery in floods and natural disasters, and will use it in case of a disaster or emergency period from an air pollution source. The three moves of primary importance that the Office of Civil Defense makes are: first, the planning for disaster and working with all the other agencies in the State in the plan for coping with a disaster; second, the actual direction of a disaster program or operation once a state of extreme emergency has been declared; and third, a long-time continuing program of monitoring of the air in California for radioactive content. There are some 17 stations where there is daily and semicontinuous sampling of the air for radioactive particulate content, and there are 17 mobile laboratory trucks for radiological assay, which have been assigned to various departments of the State for continuous use and continuous maintenance in an operating condition. Our Department has one of these, some are in local health departments, some in water departments, some in sanitation districts, and the like. These trucks are kept alive, and kept used, not on sterile exercises, but on the study of actual and living important problems.

Next, the University of California, an agency of the State of California, has three primary responsibilities at the present time in our programs. The first and most obvious one is that of training and education, not on a two week basis, but on a one year graduate basis or on a four year curriculum basis. At the present time, the University maintains some courses that are not called air pollution specifically, but are primarily designed to focus attention on the study of complex systems as a unit, and the air mass is such a system that lends itself to that type of training. Second, the University conducts basic and applied research, and we are, in California, seeing now the rapid growth of recognition of the idea that the University has a responsibility not only to itself, its students, and its faculty, in the field of research, but a responsibility to assist in the solution of pressing problems facing the State of California, as a servant of the State itself. This is not a unique concept, but the rate at which it is growing is, I think, important in California. Finally, through the agricultural experiment stations, and through the farm advisors stationed in the various counties, an arm of the extension service of the University, a State-wide program of continuous surveillance of the damage to plant life is springing underway in its first year. Now there is a direct service type of activity, going even beyond the field of applied or developmental research into actual direct service to the State itself.

The State Department of Health has a rather broad series of responsibilities, growing for the first time out of definitive legislation at the last session of the Legislature. Only two bills of importance on air pollution were put through. One bill created a unique Air Pollution Control District in six counties of the San Francisco Bay Area. Its general provisions of control are similar to the Act of 1947, but the special problems of composition of directing board, assessment of costs, and so forth, are of interest. A copy is in your folder, and I direct your attention to it. The second bill was a Department bill which we believe has this unique feature, that it is worth, in its first year, $2,000 per word to us, because our first year's appropriation, which we asked for and secured, was $250,000, to be increased substantially in the next year. I will read to the bill because it is so short, all except the last paragraph. It reads, unequivocally: "The State Department of Public Health shall maintain a program of air sanitation including but not limited to (a) the conduct of studies to determine the health effects of air pollution, (b) the determination of the physiological effects of air pollution on plant and animal life, (c) the determination of the factors responsible for air pollution, (d) the monitoring of air pollutants, (e) the development of administrative means of control of air pollution in emergencies, (f) assistance to local agencies in effectuating all the subdivisions of this section."

Growing out of that six point basic assignment, we consider that we have the following responsibilities, and I'll merely name them. First, a broad overall continuing study of the air pollution problem in the State; second, medical research to further illucidate the effect of air pollution on human beings; third, surveillance -- a broader term than monitoring -- a keeping track of the environmental factors of the variations in air quality, and simultaneously a story of what is happening to people, animals, and plants simultaneously exposed to these varying conditions; fourth, the correlation of data from all sources; fifth, the interpretation of findings -- one of the most obvious points, I think to all of us, is that with a great babble of voices, who is going to interpret, and who is to tell the common man, John Q. Citizen, how we're doing and what all this means. The interpretation, we think, is strategically and peculiarly a function of State government within the State, just as it is within the Federal Government within the United States. Sixth, a term that I'd found to be peculiarly lacking in the discussions to date, "planning". Seventh, a development of a plan for emergency action. If you've read the currently officially adopted emergency plan for the County of Los Angeles for the system of three alert levels, I think you will recognize the urgency of this problem. Eighth, the dissemination of information. Acting on a suggestion from Dean Boelter, the development of a mailing list was undertaken for a large variety of officially distributed works, not only on research, but on interpretation, for general distribution of information on what is going on in the State at large. We decided to tap a new field of interest, not very active, and so we wrote to every city and county engineer in the State, and merely asked them the question, "Are you interested in receiving research reports from the University and a wide variety of reports distributed by our Department?" We didn't include a self-addressed envelope, and we didn't send a questionnaire. We asked a question, and if it was going to be answered, someone had to dictate a letter, put a three cent stamp on, and virtually 100 percent of these men wrote back definite letters of interest. We sent them to governing bodies, but now we plan to mobilize the engineering profession to develop interest in this field.

Local health departments of California share responsibility with the State for surveillance, because in California, local health departments enforce State law. They have the responsibility, as they always have had, for nuisance abatement, and when problems on air pollution situations in an area are at the early stage, where a point source effects a definite area, nuisance abatement is the mechanism of dealing with that problem. We have very definite ideas of the tremendous strength and usability of nuisance statutes. We consider it one of the strongest statutes there is, partly because of its antiquity, coming down in common law with ancient origins, and being so deeply embedded, that we think that the only thing that is needed to make nuisance statutes effective, is the engineering that goes with it in the accumulation, documentation, and presentation of data on the level and extent of human nuisance resulting from a known source. Local consultation and planning is a third responsibility of local health departments, and of Air Pollution Control Districts in California. They have been given a large share of responsibility for action because the function of regulation and control is there. They have other responsibilities -- among which are monitoring or surveillance to maintain the continuous knowledge of air quality, meteorological studies to determine air volume, inventory of sources to determine loadings so that they have at their hands the engineering data necessary to design a program to maintain, or rather to bring up to and maintain air quality at a predetermined planned level. Without such data, the program is entirely empiric, is entirely wishful, entirely trial and error, and usually ends in something less than success. Planning, informing, and educating the public is a sizeable area of responsibility.

Among the unofficial agencies in California are not only all the private schools and universities, but also the unofficial research groups such as Stanford Research Institute, unofficial coordinating groups such the new Air Pollution Foundation, and other agencies as the State Chamber of Commerce, State and local medical societies, and the like.

We can see that these unofficial groups have heavy responsibility, and they have demonstrated action in the field of planning, research, consultation, and the dissemination of information. One of the favorite means of dissemination of information in California is this phenomenon called a conference or a hearing, usually a State-wide hearing in which you hire the largest hall that you can get, and you pack it with people like yourselves, and you really have a day. You start out with the Governor, and you end up with spontaneous speeches from the floor.

Now I'm not going to run through the diagram on the board. The heavy lines are intended to indicate a primary and very frequent, an almost continuing, interflow of relationships relating to programs. It's represented by very frequent personal visits, very frequent telephone calls, and the real flow of authority as in Legislature, etc. The dotted lines indicate a secondary, but extremely important, and usually a less official, type of relationship. Now obviously, many other agencies could be shown and intercommunicating lines of some sort would have to be drawn, giving lines of relationship. I have not drawn all of the possible lines of relationship because these dotted lines are still very heavy business lines. A lot happens along those lines, and the less tangible ones that are not shown seem to be below that level.

To repeat again, the figure represents a dynamic internetwork of interrelationships in a State where some 12 million people consider air pollution a subject they discuss before they discuss the weather.

FLANAGAN: Mr. Stead has a considerable advantage in discussing this subject, because of the existing complexities and the extent of activities in California. I'm sure, in that type of framework, as we've seen in other phases of health work, that the matter of contacts is rather not so much a permissive situation, as a compulsive situation. The ability to pick up the telephone and keep in touch with a counterpart or a neighbor, or others with whom he has to work, means the difference between success or failure.

GILBERTSON: I'd like to ask Mr. Stead whether the California State Department of Public Health, under the new State law, proposes to issue any rules, regulations or standards for State-wide application, and if so, whether you propose to use such groups as this for an advisory board, or whether an entirely different approach might be taken?

STEAD: Mr. Gilbertson has asked two questions. The first one, the only thing we are trying to standardize for beginning purposes at the present time in California, is the technique of surveillance of simultaneously keeping track of environment of man, or living things; that we are trying to do and get underway rapidly. With respect to some sort of an advisory board or committee, our Department has about 30 advisory committees on these big horizontal problems that sweep across many interests, and we probably will have a technical advisory committee of that sort without very much delay. It might seem strange to you to say that we find it necessary to have a very sizeable advisory committee within the Department itself to pull our own programs together, and to keep the cylinders from exploding all at the same time. With respect to general adoption of State-wide policy, however, which is different from a technical committee's functioning, our only beginning was the arranging of this meeting of Governmental agencies in Berkeley two months ago, attended by the Public Health Service, our Department, representatives of conference of local health officers, the State university, and the two active Air Pollution Control Districts. At that time, it was agreed that at the next meeting of that general sort, when we are discussing program planning more or less as a whole, and trying to discuss the relative roles, we would bring in the unofficial agencies, including the Foundation, Stanford Research, and the other schools and universities. Now every bill in previous Legislatures (there have been several bills — at every one since 1949) has set as the State agency, a board composed of the director of this, the director of that, representative of this, representative of that, and housed it within the State Health Department. Those bills have been defeated, and this time there is no legislative mandate on a policy making board which we've been talking about, but we intend to use the official lines of government -- the obvious, the most active and the most influential unofficial agencies by our own designation as a policy advisory group.

BALLMAN: May I make one comment on this emergency regulation. We've heard a lot about it, and it has been my recent privilege to give it some time and study. May I quote from the preamble to this regulation. "Past history indicates that the possibility of such a catastrophe is extremely remote." This would indicate that while there is presently no immediate need for this type of regulation, that possibly in the future some regulation may be necessary.

The first alert as stipulated is merely an alarm system. I don't think that anything in particular is done except to say that something might happen. The second alert, as I see it, is an administrative impossibility, because it places undue responsibility on one man or one group of men, without sufficient factual data to back them up. If they close plants down, they're in trouble, and if they don't close them down, they're in trouble. They must take these actions without the benefit of factual background. The third alarm, at which time the Governor moves in with emergency powers, and which, as I see it, will take a period of time, is not going to happen instantaneously. At this time, there will be sizeable quantities of contaminants in the air. We don't know enough about exposures of human beings to such quantities, or the period of time that they may be subjected to them, before adverse effects are noted. This system of polluting the air is like a flywheel, and it's going to keep going sometime after plants are shut down.

Los Angeles County and California have really gone all out in setting up this emergency rule -- it's a first effort. As a first effort, I think everybody should pause and look this emergency regulation over very carefully, because in it we may find a false sense of security that could undo much of the good work that has been accomplished to date. We hope that they'll never have to use that third alarm.

Another small area of question I had in mind -- the emergency regulation refers in the body to hydrocarbon content, but in the table of stipulated quantities, hydrocarbons are mysteriously missing. May I again reiterate that we should be very careful in our evaluation of this regulation, and not be too quick to say, "this is it", — it may or it may not be.

STEAD: I underscore all the points which Mr. Ballman has made. The origin of this emergency plan was entirely local and was not participated in by our Department, although we most thoroughly endorse the idea that there must be such a plan with a machinery for its activation and a machinery for its implementation. Now the second point I would like to make — and I don't think it can be stressed too strongly — is that I doubt whether anyone (any of the proponents of the plan) would say that the values of the four gases that trigger off this alarm system at the values scheduled, are per se what the sanctions or administrative actions would imply, and none of them per se, as far as I know, in anybody's opinion, represent levels of toxic substances that constitute in themselves an imminent danger to human life. What I think they do represent is a principle of monitoring, namely, that monitoring is not chemical analysis to completely describe what is in the air — monitoring is a handle. Monitoring is merely measurement of an index that you believe will rise and fall with the important thing that you're talking about -- the effect of air on living things. Our highest priority in participating in this monitoring system in Los Angeles is calibrating it against what happens to living things at the various levels, so that even before the research has furnished the explanation chemically and biologically, the relationship will have been pinned down reliably, and the alert levels will be calibrated so that they furnish something better than guesswork, so that they furnish an administratively feasible trigger to kick off the extremely drastic sanctions contemplated. Now, how is it to be calibrated? It is calibrated in a variety of measurements of plants, animals, and humans (not only normal humans, but abnormal humans).

It is calibrated in part by direct deliberate exposure to human beings to various levels of concentration. One missing link, however, I wish to point out. This calibration at the present time has got to be done by accepting what Mother Nature gives us in Los Angeles in the way of smog air, and that will be the case until we are able to manage the environment in the manner employed in this large scale environmental test facility, I mentioned earlier.

There is not complete harmony of points of view on monitoring and the expert committee advising the air pollution district, and possibly the board of supervisors, has stipulated that the alarm system with respect to oxidants be activated only by rubber cracking test for ozone, which was thought, at the time they made the announcement, would be rather specific for ozone, but now it's ozone plus something else — so that every alarm goes off in this manner — a Bechman oxidant recorder gives you a net excess of oxidants over reducing agents, gets up pretty close to the alert level, and then immediately a rubber cracking test is made by a man dispatched to that point. Then, and only then, does the alarm go off. Our own philosophy, as I indicated, is that monitoring is an index, and we therefore, lean toward a broader measurement of oxidants, that is, of oxidants unaffected by reducing agents.

FLANAGAN: It is a considerable pleasure to introduce Mr. Vernon G. MacKenzie, Assistant Chief for Research and Development, Division of Sanitary Engineering Services, U. S. Public Health Service, Washington, D. C., who will speak to us on State-Federal relations.

State-Federal Relations

Vernon G. MacKenzie

In the United States, relations between the Federal Government and the States have undergone a continuous evolution. Nothing that I am going to say, perhaps, can be new, nor will it be unorthodox.

In the public health field we have, I think, an example of a pattern of successful Federal-State relations which has developed over a long period. With respect to air pollution, the basis for a pattern of Federal-State relationship has been the subject of a declaration of congressional policy. In Public Law 159, passed by the 84th Congress, and approved by the President just this last July, Congress declared the following policy composed of two principal parts: (1) To preserve and protect the primary responsibilities of the States and local governments in controlling air pollution, and (2) To provide Federal technical services and support and aid for technical research, to devise and develop methods of abating air pollution. The important thing to note here is that this policy declaration emphasizes the responsibility of the States and their local governments for the legal control of air pollution, and casts the role of the Federal government as one of assistance to them, through research and technical assistance. This policy declaration by Congress relating to air pollution is completely consistent with the traditional and legal relationship between the Public Health Service and the States. While the Service has some direct responsibilities concerned generally with the prevention of the interstate spread of disease, its major mission, for over a century, has been to "back up" the States. This mission is codified into law in the Public Health Service Act which provides that the Surgeon General shall assist and advise States and local authorities in enforcement of their health regulations, and advise the States on matters relating to the preservation and improvement of public health. These traditional and legal relations are firmly based on the Constitution under which the States retain all governmental responsibilities, except those specifically delegated to the Federal Government. One of the important powers retained by the States is the general police power, on which the regulations for protection of public health and the abatement of nuisances, generally are based. In carrying out their general responsibilities in these fields, the States have delegated some of their powers to local governments, operating under State authorization.

Yesterday and today we have heard much about the history, extent, varied character, and problems of air pollution, and methods for its control. Mr. Stern has indicated in one estimate, that over 10,000 communities in the United States are troubled with air pollution problems. The wide extent of air pollution is perhaps apparent to most of us here, and the diversity of technical and administrative problems involved, make it desirable that control be handled on the governmental level closest to the situation. Technical services for handling air pollution problems are not available in small communities, and could best be provided, perhaps, by States. Most States are now providing some service of this kind on an ad hoc basis, and a few, of which we have heard mention here, have organized air pollution control and technical assistance programs. With the growing importance of air pollution and consequent increasing interest in it, a general pattern of Federal, State, and local government relationship appears to be developing, which is similar to that which exists in the general field of public health. On the basis of long experience in cooperating with the States, we believe this trend to be sound and one which should be encouraged in our activities under Public Law 159.

Copies of Public Law 159 are included in the packets which have been distributed to you. I will not go into all the details of the methods by which Federal assistance is authorized in the field of air pollution.

Yesterday, Arthur C. Stern described in general terms the Service's Air Pollution Program, including the technical assistance available through the Sanitary Engineering Center, and its participation in joint studies with State and local agencies. There are two additional means for extending Federal assistance authorized in the Act, for which no funds have been made available this fiscal year. These are by grants-in-aid for support of training, and demonstration projects. Planning has not been completed by the Public Health Service for implementing the Act in these respects. Progress in air pollution control is said to be retarded by a shortage of technical and professional personnel with suitable background and training. If so, can Federal training grants be useful to remedy this situation, and to whom should such grants be made to be most effective? Should they be made to the universities, to States and local control agencies, or perhaps to individuals through fellowships? Constructive comments on these matters would be welcomed by us; perhaps, we can get some discussion on this during the session on training this afternoon. Somewhat similar questions may be raised about grants for support of demonstration projects. Mr. Stead indicated that such projects probably would be included in the program of the State of California. Is there need for Federal support to demonstrate the effectiveness of certain air pollution control techniques on which adequate technical information may be already available, or do the States and local agencies need assistance in assaying the extent of their air pollution problems as a basis for planning definitive control programs?

I have limited my discussion on Federal-State relations largely to relations between the Public Health Service and the States. This is appropriate with respect to operations under Public Law 159. However, it should not be inferred that the States will not have dealings with other Federal agencies, such as an Atomic Energy Commission or the Department of Defense, for example, which have direct responsibilities concerned with emission of air pollutants from establishments operated or controlled by them. In order to provide liaison between the various Federal agencies concerned with air pollution, and to promote coordination of uniform Federal policy on these problems, a Federal Interdepartmental Advisory Committee on Community Air Pollution is being established under the Chairmanship of the Department of Health, Education, and Welfare. The Committee will have members from the Department of Agriculture, the Department of Commerce, the Department of Interior, the Department of Defense, the Atomic Energy Commission, and the National Science Foundation. The activities of this Committee are expected also to facilitate appropriate use, on air pollution research, of technical competence and facilities wherever located in the Federal establishment.

In summary, there remain many problems to work out involving the common interests in air pollution by State, local, and Federal Governments. However, the Congressional declaration of policy in Public Law 159, and the traditional Federal-State relationship which has proved its effectiveness in the health field, provide a sound foundation on which to base cooperative and supplementing activities by all the levels of government involved.

PLANNING CONSIDERATIONS

Wednesday, September 21, 1955 - Afternoon Session

Arthur C. Stern, Chairman

STERN: The meeting for this afternoon will give you an opportunity to discuss the various components of a State or local air pollution control program; personnel, training, laboratory, equipment, and budget. First, Mr. Harry Kramer, Chief of Training for the Center, is going to discuss the subject of training. Then we're going to ask the six individuals whose names were read this morning to come up and spend about half an hour in a round table discussion of personnel problems. Then we'll replace them in turn with the people designated as the panels for laboratory, equipment, and budget.

Training

Harry P. Kramer

Training is a broad subject having many phases or aspects, but my coverage will be limited to activities at the Sanitary Engineering Center. It is hoped during this session to gain an idea of training needs in the field of air pollution which might be supplied from this Center.

Air pollution is the newest activity to be added to the training program in Cincinnati. Previous to its coming, there were operating training programs in the following fields:

1. Civil Defense
2. Milk and Food
3. Radiological Health
4. Water Supply and Water Pollution Control

Announcement is made annually of all of the courses planned for the coming fiscal year in the "Training Programs" bulletin. The courses for which dates are announced in this bulletin are for presentation in Cincinnati. The courses presented in Cincinnati can be broad in aspect, much broader than anything that can be offered in the field away from Cincinnati. This is so because the basic training staff is small and greatly implemented by research persons at the Center, and by a few outstanding special consultants. These faculty resources are not readily available for field courses.

In addition to the programs scheduled for presentation in Cincinnati, arrangements are made for presentation of field courses in States or local areas upon request from the qualified State agency. These field courses are usually the outgrowth of the parent courses presented in Cincinnati, but somewhat reduced in scope. The burden of carrying out field courses is borne by a small training group with the assistance of Public Health Service Regional Offices and State and local agency people. Scheduling of field courses is a difficult problem, and requests for such presentations should reach the Center far in advance of the planned date or dates of presentation.

As new training programs are being developed at the Center, it is rarely attempted to schedule field presentations. Field courses are not offered until after the program has been carefully developed for presentation at home. Five air pollution courses are scheduled for presentation in Cincinnati in fiscal year 1956. Three of these are of a technical nature.

In the Center training activities, there is no relationship to the academic approach of giving broad general training, such as might be given in academic institutions. The courses normally range from one day to two weeks in length, and cover primarily the areas to which the Center is devoting great attention in research or investigation. To be productive, the courses must also fulfill a dynamic need in their respective fields. That is why comments as to your most important training needs are earnestly desired.

People from State and local agencies, industry, the Armed Forces, other Federal agencies, universities, and other agencies have attended Center courses in previous years. They have been professional people, and the record for the last fiscal year indicated that about 68 percent of them had advanced degrees. Support and participation in the training programs are sought from industry, universities, and other people in our training program.

Under the terms of the recent Federal air pollution legislation, other possibilities for training have been opened. Funds might be provided to educational institutions or to State or local agencies, for the professional training of selected staff members or selected individuals, who may elect careers in the field of air pollution. With this brief summary, I would like to open the meeting for comments and discussion.

MUNROE: How far are you prepared to go at the present time in supporting training in universities in the country? Are you in a position to sponsor or finance training projects in universities?

KRAMER: I'd like to pass it on to Mr. Stern. The authority is there, but not the funds at present; is that correct?

STERN: That's correct. We would like to hear an expression of opinion from this conference as to the preferable means of support. Should it go to universities directly and have them choose the students to be educated; go to the States and have them choose the students; or go to a central agency such as the Public Health Service and have them choose the students? We'd like to have your opinion on it.

PURDOM: We, of course, have need for training of personnel over and beyond our own resources. Of course, in those instances, we like to look to agencies such as the Public Health Service for that kind of service. One problem with us, perhaps true of any large jurisdiction, is that we are limited in funds to pay expenses of personnel to go to distant points for training. We have large numbers of personnel to train, and we're looking anxiously to the day when it might be possible for the Public Health Service to conduct some training program out in the field. I think that perhaps even smaller places might be just as much in the same predicament. Perhaps they could send personnel to a nearby regional session easier than they could come to one particular location. Even so, we do take advantage of the services here in Cincinnati and try sometime during each year to send some of our men in responsible positions here for training. We depend on them to pass it on to other people.

There is one problem though, and that is having people to train. I wonder if any consideration has ever been given to the possibility of encouraging high schools, or some lower level of training, to send seniors to a place such as this — only special trips for a day or half a day — to see what the opportunities might be in this field. They might then go to college to study with the idea of going to work in this type of profession. I think there is some need of going back that far, if we're going to supply the personnel that we all need.

We have positions that have been vacant for a couple of years for engineers, and have an expanded program for next year which will mean more budgeted vacancies. I think every health department is in the same position or a similar position, and I think that's one aspect that needs attention.

KRAMER: That's a very interesting comment. Locally, we have had a large number of high school science clubs and groups pass through to see this facility, but I think that a very special problem that applies to all of us and perhaps the technique is just being discussed among our group; namely, that we might pick off as an experimental operation some local high school to see if we could get perhaps half a dozen people from our group here, representing different competencies, to perhaps present a 30 minute discussion about their work to science groups in a school, with the idea and purpose of finding out whether we have been able to generate a sincere interest and desire of adopting a profession similar to this as their life work. I don't think the message has been conveyed to these younger people very well in the past; we've always been with more high level official organizations, but I don't believe there's a man in this room who, if this thing were presented in a proper fashion, could not perhaps contribute something in this fashion to a school very close to his neighborhood. I'm sure that the teachers in a school would welcome such a thing, because here you have, or you can get, a breadth of experience which I think that the teacher cannot get to the student -- and a message to them that might generate this desire, and I'd be very much interested in hearing any other comment upon this area.

HART: On your point there, in connection with the invitation of students to come out here for observation. While I think your plan has merit, I'm of the opinion that more good might be accomplished by providing opportunities for the science teachers in our secondary schools to work here during the summer months. These teachers, with this experience as they get back into the classrooms, would be much better equipped to interpret the work of the scientist in sanitary engineering to the students. To me, this is a matter to which the whole sanitary engineering profession needs to give some thought. In my opinion, the waterworks operators, the sewage treatment plant operators, consulting engineering firms in the sanitary field, and even health departments, might well pursue a similar course in connection with summer employment for these science teachers in the high schools. Through the efforts of these teachers, I am certain that many thousands of students would turn to public health as a career.

The National Health Council has sponsored a Health Careers Project. The Equitable Life Assurance Society aided the National Health Council in publishing and distributing the Health Careers Guidebook. This guidebook has been sent to all high schools in the country. Undoubtedly it will prove extremely valuable in assisting students to make a sound career decision in the health field.

BALLMAN: Getting young men interested in any service today is rather a complex one. Those of you who have had any experience in trying to sell boys on any idea in a general field, such as law, medicine, and engineering, and you see these advisory groups that are going around the high schools, will probably realize that many young men are becoming confused in their selection of a field of activity. In the past, universities were not too well chosen; consequently, some high schools' efforts are being made to fit the individual into the proper university for his training. When an individual gets out of school (university), we have a mass rush of all the industrial representatives to sell the graduates on their activity and company. There are more employers than students on the campus, it looks like registration day. This effort to get graduates sets up a terrific field of competition. I'm not discouraging what you're saying, but let's not think we're the only ones with this idea.

We are discussing candidates for Governmental jobs by and large. These jobs are on the low end of the totem pole salary-wise. True, these jobs offer wide ranges of experience, but the boys don't want to trade a broader education in your activity for a higher salary in industry. They want money, and you don't have it to offer.

I would like to suggest a secondary activity in the over-45 group. I've had a measure of success in the small areas that I've worked in getting men.in the 45 and 50 area who have special training and have reached the point of retirement, or semi-retirement (I'm not talking about the 65 group). You can pick up some rather good mechanics -- good technicians — and with suitable training and their willingness to work and their ability to apply themselves — many times they'll have faster results than some of the younger men. Another thing is they'll stay with you. They aren't gone in a few years.

May I also ask that this group define the training area you're talking about. It occurs to me that you would probably have two, possibly three, training areas. You'd have the laboratory technician, you'd have the field man who could be part technician and part enforcement officer, and you would have administration. Your areas of training and your application are going to be different for each group, so I can't see how you're going to determine where you're going to go in this program or how you're going to do it until you define the three groups.

The next point I'd like to bring up is, Mr. Stead's been talking on this one, and I think properly so — the three areas of interest we have here; the old smoke control official, the industrial hygienist, and the air pollution control official. In a sense there has been a spirit of competition among the three groups, each thinking that he has the answer, each applying devices and procedures that the others didn't too quickly understand. I think your training program should be pretty quickly directed toward the breaking down of any fences caused by differing procedures and applications of those three groups. Shortly, we will be putting good technicians out in the field that know about a specific area of endeavor, but you may not have administrators to organize them into programs. Here is a possible breakdown if you don't bring the administrative group along with the technicians. Administrators are hard to define or evaluate. One of the basic weaknesses lies in our inability to evaluate good administrators for these programs through Civil Service exams. In the past, exams used for administrators were designed for technicians or engineers. An immediate challenge is to set up reasonable examinations for such positions. Until you have administrators who have the whole breadth of the problem, legal-wise, technical-wise, and otherwise, training your technician is going to be a lost effort.

BOELTER: I'm speaking to the point of enticing or conditioning youngsters in high schools and college to consider working in this particular area with which this conference is concerned. I think the very name "smoke" or the name "air pollution", or to digress into another resource area, water "stream pollution", is a negative force. Young men today are in engineering colleges to go into new areas of activity. They do not want to go into electronics, but into transistors and microwaves. They don't wish to study mechanical engineering, they wish to learn about gas turbines, supersonic airplanes, and different kinds of new systems. You have the opportunity of presenting the problem with which you are concerned — the solution for which you are responsible, namely, of introducing a concept which has been utilized in the country since the time of Theodore Roosevelt, namely, conservation. You can talk about air as a resource; instead of talking about polluting air, you can talk about air as a resource and you can demonstrate that in some areas, the air as a resource has been greatly depleted, and in other areas it is still available in somewhat its original form. If you present your problems to youngsters as a new challenge, a new approach, you're likely to attract a few good students. Won't you please change your nomenclature in dealing with this most wonderful resource available to man, namely, the air around him, in its pristine forms.

JOHNSON: Getting back to the original question of how the education might be applied, first of all, we must decide over the country how many people we'll need to educate, and then how much money we have to do it with, and how we are going to apply it. There will be a limited number of openings for college men in this field. We're going to need technicians, many of them we'll have to take will not be of the college level. We just spoke of that problem. At the college level, we could not take every college in Ohio or one in every state as I see it and set up courses. It appears to me that in order to start, we're going to have to go into a scholarship proposition, and somewhat narrow it down at least in the beginning, to the number of schools or colleges where these courses will go into effect.

KRAMER: Would you like to amplify that just a little further, and designate who would make this selection; what schools, and who would actually make the selection.

JOHNSON: To be very frank, I haven't given that much thought to it; it's something very new to me. Some advisory group would have to do some work on it. I just don't see how you can go to the 48 states and work up something in every school. It costs a lot of money to set up every course. You're going to have to have a number of courses, and so you get into a financial problem, and I think to start with that some of the schools which have already done some work on this would be the most interested in making a start on this.

PICKARD: I'd hate to see the training moved away from this Center right here, I'll say that, but certainly I would like to suggest that some thought be given to co-op schools such as I think the University of Cincinnati is, and I know that the University of Louisville is. Certain of our industries in Louisville take the students during the summer months, or on a six month period, and bring them into their factories to work on engineering problems. There could be a great number of sanitary engineers, chemical engineers, and others, who could be furnished summertime employment, if the Center could get on the co-op school's accredited list for taking those students. We might then attract some of these once they graduate. I'm sure our industries are doing that now, and some students who work in the summer do come back once they graduate to work in industry.

SHARRAH: Personally I'm a recalcitrant when it comes to giving away this type education. I don't think you can give it away and get the best type of man. I think you've got to give them something that's saleable — make them want it and make them work for it. I think we'll get a better bunch of people. Anything that you make so easy that anybody may coast into it will not attract the best type employee. I want to sell it to an individual and make him work for it.

HARSTAD: I don't feel that all of the training should take place in Cincinnati. It's a long way to travel from the Northwest out here, and communications are awkward. The logical thing to do is to pass out among the 48 states with the training program. Don't make a complete gift of the training program, but, at least, make it accessible to the smaller communities. Possibly a course offered in a state institution in each state, tailored especially to the problems of that area, would bring financial cooperation from the institution and both student and municipal cooperation in attendance. Communities or areas in the Northwest have one or two main problems and it is doubtful if a community will be interested in sending a representative 2,000 miles for an extended period to receive training that omits or touches very lightly on its peculiar problem(s). It may appeal to one state-wide representative, but that doesn't get to the grass roots which the community represents.

STERN: Dean Boelter, do you want to tell us about your test facility?

All Purpose-Air Pollution Test Facility

L. M. K. Boelter

I thought you might be interested in hearing about the feasibility study that we are attempting to make on an air resource facility. Under the emergency program of the Governor, which Mr. Stead referred to this morning, a sum of money, around $17,000, was set aside to begin this feasibility study. Through this feasibility study we mean to discover whether it is possible to make an all-purpose facility for the testing of animals, plants, materials, and humans in both the actual polluted environment, and also in synthetic pollutant environments, so that the performance of materials and life systems may be observed under controlled conditions. This feasibility study will also determine where this type of facility should be located. As an example, if oxidants or some of them are generated by photo-chemical processes, if they depend upon the energy of the sun, then quite clearly a location for this type of facility would be in a place where the sun shines most of the time, and that would be, say, in the Mojave Desert, or in the Imperial Valley, or somewhere quite a distance from the metropolitan area and the coastal plain. If in turn, an artificial sun to generate these particular reactions can be utilized, then the location of this facility can be near some metropolitan area. A fairly large facility appears to be necessary in order that outdoor uncontrolled conditions can be simulated and controlled.

Another point is that in making the feasibility study, we wish to compare the advantages and disadvantages of an all-purpose facility with a series of single purpose facilities. For indeed, we may discover that, from the personnel point of view and from the training point of view, a half dozen smaller facilities rather than the all-purpose facility would be more desirable. Quite clearly, the feasibility study will also involve the question of cost. We've so far thought relatively modestly in terms of a figure around a half million -- in two quarter of a million portions.

An additional purpose of this facility would be to provide the different contaminants for the special purpose test chambers. Many of our cooperative perimeters would like to have a source of contaminants, and you probably know that obtaining these contaminants from the actual environment is at the present moment not entirely satisfactory. The comments present the general concept.

Some of you may think the concept is not well founded. Please communicate your reactions to me. I assume that not many of these all-purpose facilities (if found possible) will be constructed; and I therefore hope that it can (if constructed) meet the needs of a large number of the individuals and organizations present here today.

Panel Discussion on Personnel Needs

J. Robert Cameron
L. F. Garber
Karl M. Mason
Jacob S. Sharrah
Frank M. Stead
Martin C. Wukasch

STERN: Let us attack the question of personnel needs in terms of numbers, qualifications, training -- how we're going to get it and what we're going to need in setting up air pollution control programs at State level.

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GARBER: Frankly, I don't know the answer to the problem. I think it's hardly necessary to repeat what has already been said about the difficulty of recruiting personnel and holding personnel. Certainly your divisions of health are at a decided disadvantage salary-wise to attract young engineers and young technical personnel, and hold them. I can only say what we have tentatively considered in Missouri, and that is to try to throw as much of this activity in air pollution over into the local health departments as possible. Now admittedly, that has not solved the problem of getting the technical personnel that we need for the guidance of these local people, and I frankly don't know what the answer is. This approach has certain advantages I think, in that you get the local people interested in a problem of atmospheric pollution; you get them to take care of their local problems, to reach their own solutions. It has some disadvantage in that coordination of all local programs to give an overall picture of what the condition of the State may be is sometimes difficult and sometimes impossible. Frankly, I think it has to be a compromise between those two -- using local programs with local personnel to administer local programs and collect samples, and the State organization as a coordinating and technical advisory body to guide and coordinate these local programs in an attempt to get a picture of what your atmospheric pollution problem is in the State. I don't know any other solution.

STERN: I think as much as anything, we want to direct our discussion to what our personnel needs are going to be. For instance, are we talking in terms of needs for a lot of chemists, or very few of them? How do we go about getting those that we need?

CAMERON: I think it would be better if we consider who is going to administer the air pollution program before we discuss the operations of the chemist and other laboratory personnel. In considering the administration of the program, we come back to some basic considerations: Are you going to put the administration in an existing department? Will you put the administration in the State Health Agency or some other agency within the State? In placing the responsibility for administration, will we be throwing an extra load on an already burdened department? In other words, are we going to give some department another job without sufficient funds to administer the program? If the department is fortunate enough to be appropriated the funds, who is going to be responsible for administering the program?

If we place the responsibility in the State Department of Health, should we put it under a medical official, or should we put it under the State Sanitary Engineer? In my opinion, this is a question which I think depends to a great extent upon the local situation. However, I would like to make a plea to give the responsibility to an administrator who has had some experience in being "put through the mill." I have heard some people say that this type of job should be given to a businessman or industry representative, so that it will be "run like a private business."

I believe in running a health program or an air pollution program in a businesslike way, but I do not necessarily feel that a businessman, who often has had no experience with handling people, should administer an air pollution program. I am not necessarily making a plea for the responsibility of air pollution administration to be placed in the health department; however, I feel that health departments could do a good job of administering the program if proper funds and adequately trained people are made available to them. I feel that we should discuss the administration of an air pollution program. I do not feel that we should be "pushing" our own specified profession, but that we should engage in a logical discussion of air pollution control administration.

STEAD: I think the principal public interest in air quality is a human interest — not by any means excluding the others. That being the case, the problem is fundamentally a problem of human ecology; that is, the adjustment of humans to environment or environment to humans, and the latter is really what it shakes down to. I think experience shows that if you don't recognize this fact, if you give the nod to an agency that has confidence and experience only in handling the inanimate things, either that agency has got to grow awfully fast, or you "come a cropper" sooner or later. Furthermore, you must consider, I think, a spectrum of living things in relation to the living things and the air environment. Now this does not narrow it down. The only thing unique about health departments in the United States is that you do have coverage — square mile coverage — of an organization that has been dealing with people and their environment virtually in every square mile in the United States. Now there are other such agencies that have the technical ability, but none with a backlog of experience. You can build a brand new organization, but it is expensive to do so. Two illustrations from our own state: In Los Angeles, where the regulating responsbility was given to a new agency in Government, the per capita cost, as well as the tax rate, as well as a total dollar figure was relatively high compared to the case in Santa Clara County, where the assignment for the first few years of the program was given to an existing health department. They took in their stride the same job with far less expenditure of new dollars. So that introduces the possibility of the health department's being a transitional service in the investigatory and interpretive and sizing up stage, and not necessarily being given the responsibility for permanent control.

I'd like to make one point on laboratory, because of shortage of engineers and similarly trained personnel and relative plentifulness of laboratory personnel of the same scientific caliber and competency, we have envisaged that we will use in air pollution work a one to one ratio of laboratory and field engineering staff; whereas, in food and drug work, water work, and sewage work, we have used a one to two, that is, one laboratory to two engineers. We think the one to one ratio is going to make a better use of the existent supply.

GARBER: Is it your intention to use some of these laboratory men as field men?

STEAD: Indeed, yes. Heavy responsibilities and the development of instrumentation and the application of it. The main job of repetitive measurement, we propose to make a laboratory responsibility, which means that they're going to get sunburned.

STERN: Are you going to have some personnel needs in Pennsylvania?

MASON: Yes, we will have need for additional personnel in Pennsylvania, but first, I would like to have this panel explore Mr. Cameron's question a bit further. I believe we have evaded the point of assigning department or unit responsibility for air pollution so far in this Seminar. Someone will have to decide which professional categories are going to have the responsibility for the administration of air pollution control programs. Assuming that most of us here are biased in favor of placing this activity in the official health agencies, I would like to have this panel voice its opinions regarding the location and top administrative personnel within a department of health. Should such a program be a function of the occupational health or industrial hygiene unit, or should it be placed in the sanitary engineering or environmental sanitation division? In either case, would it be recommended that the top administrator be a physician, an engineer, a chemist, or a member of some other profession? For many health departments which are planning to initiate or expand air pollution control programs, these are important questions which require immediate attention.

SHARRAH: Well, first, I'd like to ask if we've ever taken stock of ourselves in this matter of personnel. We surround ourselves with a puritanical aura to protect ourselves from political ravages. We assume an esoteric, with all due respect for the word to Dr. Greenburg, benigness, and then we go out to try to recruit adequate personnel. We subject a man to a thoroughgoing examination. We then appoint him provisionally at a lower salary than he may be able to get any place else. Then, immediately he finds that he is limited in his decisions, that the Governmental hierarchy which he has gotten into is such that he can just about decide when to go to bed and that's all.

But still, there is nothing wrong with that. I'm just merely saying that that's what we have to sell, and believe me, I've tried it in the past years and that's exactly what you have to do. Now, when you do get your young individual, you send him out on his own, after limited amount of time and, usually it's far too short. Then, often you have to go out and rescue him. The ultimate answer I think is this, and Mr. Ballman touched on it. There are a lot of men now who were originally trained as chemists and engineers who are now at the so-called middle-aged level, who do make very good employees. We were able to get hold of a few who come into that category, and they are paying off for us right now. I'm speaking also of industrial hygiene in which we have far more personnel than air pollution. Nevertheless, the fundamental trend for both is somewhat similar. Now to answer the question Mr. Mason poses, I think it can be answered from a general standpoint right here. Obviously, we in Pennsylvania have far more industrial plants than there are in Oregon. The amount of field personnel, the amount of laboratory personnel, and the very instruments themselves may not only be different in number but different in character. As to the ability of selected personnel, I will go along with our gentleman friend from California, that a man who is technically good enough to run a laboratory can, in a short time, be technically good enough to do at least a great many of the problems.

You will find, I think, in air pollution, and I'm just going to make a leaping guess, that 90 percent of your problems have a precedence. Only some 10 percent may be new each time; so if you get a limited amount of personnel, and have them experienced in meeting certain problems, they can carry on well for themselves in a surprisingly short period of time. As to how many each program needs, I don't think anybody can tell. I think you have to determine that, and as I said this morning, after you determine what you're going to do.

What are you going to do in air pollution? Are you going to scratch the surface, or are you really going to get in and carry on? Are you going to control the problems yourself, and how far in each thing? How much are you going to do, and relatedly, how much cooperation are you going to get from your local areas? How much are you going to take over where they don't go along with your program? Those things all determine the character and number of your personnel.

If you're going to run a control program, and you've decided to do just that, the establishing of a multiciplicity of sampling stations for trace amounts may be a waste of time.

If you're going to have a control program, it may be initiated without benchmarks. It may be done without applying regulations until proper standards for local situations have been found. As a matter of fact, in most cases, you may not even need regulations. Now I'm not advocating no regulations, but if you have none, you still may do an even better job.

A good control officer, and I think almost anyone here can do it, with the right amount of funds and the right amount of community relationship in the matter of rounding up and bringing the people together, can get out and do a job.

How much commission are you going to get from your legislators? Are they going to give you any money? Are you going to make your own money through permits? Those questions have all got to be decided before you can proceed successfully.

We can talk about the esoteric ideas and personnel here the rest of our lives, and, until we know where we are going, that is, each individual, you can't make up your program. First, you must decide what you're going to do in the field of air pollution.

STERN: Mr. Wukasch, will you sort of summarize our personnel problem?

WUKASCH: I don't think anyone has answered the original question you proposed, Mr. Stern, as to personnel requirements. I don't believe that I have the answer for anyone else's requirements, but I can tell you of an estimate we've made. In Texas we have a new Commissioner of Health, Dr. Holle, who is keenly aware of the importance of air pollution as a public health problem, and is determined to be of further service to a demanding public. Dr. Holle was instrumental in getting the last Legislature to appropriate the first significant recent increase in our State budget, which will be used for a new building. Now that's going for a building program. I think we may have to wait another two years before we can expand our personnel. In the meantime, we are already making plans in that building to provide for increased air pollution activities which are now being undertaken by our Industrial Hygiene personnel, as time permits. We are allowing space for three technical people. This would provide a program director and two engineering assistants. Analytical services will be provided by our Division of Laboratories. We estimate that the three people on the field program would require the assistance of about two in the laboratory, so you can see we are considering a total of five people for the State program.

We believe in strengthening local programs rather than merely having a strong State program, particularly since problems vary so greatly in certain locales. A lot of latent, profound interest exists now in various local health departments throughout the State since all have received numerous air pollution complaints. A little more encouragement through technical services, or demonstration evaluation studies, would in many areas assist them in establishing their own program. I think the Harris County Program, which is in the industrial area surrounding Houston, exemplifies that. At the request of Dr. L. D. Farragut, Harris County Health Director, our Industrial Hygiene personnel several years ago investigated some of the plants there that were the chief offenders. As a result of those activities and public hearings which our Department held, the Commissioners' Court provided funds for the creation of the Harris County Stream and Air Pollution Control Program, headed up by Dr. Walter A. Quebedeaux, within the County Health Department. This was established through activating existing State Health Laws. This program consists of five people. I do not believe that any other Texas city is going to jump into the picture with a five man program immediately, but several potentialities throughout the State for the initiation of full time activities could be sighted. El Paso was on the verge of getting an ordinance passed last January, but the proposal was tabled to allow an industry committee to endeavor to obtain a maximum amount of voluntary cooperation. I think that this new Cincinnati program could be of great assistance to El Paso if a team could be provided to make a field study which would require from a week to a week and a half in completing a basic survey. I think the impetus of having someone come in from the outside would probably result in having funds provided for one full time man on air pollution control work.

Similar situations exist in San Antonio, Corpus Christi, Beaumont, Texas City, and Dallas. In Dallas we are now participating in a limited way through the operation of two sampling stations. This city is also ready to put a full time man on both industrial hygiene and air pollution control.

I hope that we do not have to wait until 1957 to have some of the field training courses activated. I know that if one can be taken in the regional area served by the Dallas Office, or perhaps brought into Austin, we can have at least 10 interested local health unit sanitary engineers in attendance. If the course lasted a week, we could probably get another 10 from private industry to insure a total attendance of at least 20 people, with minimal promotional efforts.

STERN: Which would you rather have, a good course in 1957 or a poor course in 1956? Take the State of Texas; if it sees need for about 8 persons, 5 State and about 3 local, we can multiply that by about 40 to get some idea of what our national need may be. We're talking of eventual need over the next several years for about 300 people. Does that seem a reasonable estimate?

STEAD: That would be a pretty fair estimate for health department personnel, but not for local control agencies. We would figure between 400 and 500 people are going to be professionally engaged in air pollution in California in another year. There are about 325 now. This use of local health resources I might illustrate by the fact that in the San Francisco bay area on our daily subjective appraisal of the reaction of people to air conditions, which goes along with the chemical measurement, 30 local health department personnel participate on a daily reporting basis. Our own organization within our department is made of a Bureau in the Division of Environmental Sanitation, and a special laboratory section separate from Industrial Hygiene, with a total manpower, including analysts, of 20, and the medical program is in addition to that. The State level leadership staff is the small end of the horn. I'm sure it should be too.

CAMERON: I probably have no business being up here anyway because I'm a municiapl employee — not a State man. although we are talking about a State-wide program, this certainly includes the local department. It's been our experience that the development of one program starts a chain reaction. With some proiding and encouragement, we soon find that communities may soon be anxious to jump on the bandwagon of air pollution control. I've seen this happen particularly in our own housing improvement program. All you do is talk about your program a little, and get a little money to finance the program, and the next thing you know, four other communities are ready to start a program and want personnel trained. I think this will be true in air pollution programs. So when you think in terms of 48 State programs, plus many municipal programs, you are going to throw a burden on the supply of trained air pollution control personnel.

A lot of communities that are just sitting back, and are doing a lot of thinking about doing something. When someone moves either in the State or neighboring community, they've got to keep up with the Joneses. Or perhaps, the City Council puts the heat on them, and they're going to start moving. I think this is going to be true in my area.

STERN: It seems we should estimate personnel needs as several hundred, and training needs as several thousand.

SHARRAH: We set that, Mr. Stern, at one time I think of all local personnel that it would take, approximately, 2,000 people. That's really just an idea we conjectured on and we made a guess. That's all over the United States, including smoke control, air pollution; that is, all people associated in all departments.

H. J. SCOTT: If the State of Texas needs seven people to handle air pollution problems, I don't have much to look forward to, needing seven people myself in my own program in budgeted positions that I can't find anybody to take. One job is Chief of the Bureau of Industrial Nuisances which has been vacant since the program was organized in 1947 — never having been able to find anybody of the caliber or intestinal fortitude to take the job and do the kind of a job that has to be done, at a salary that we can pay which is within the $7,000 - $8,000 bracket. Various other positions are also open, engineers and chemists (both mechanical and chemical).

BALIFF: I got the impression that possibly we're setting our sights too high here. One of the big problems as I see it here, is that air pollution is going to need many new people in a very short period of time. I believe that many of the health departments have a good source of personnel in some of your sanitarians. A good deal of the work is not actually high level engineering. Much of it is leg work, and a sanitarian who has the public health spirit, who understands the philosophy of public health, who likes his work, who's willing to work for budgeted salaries because he's doing public good, may be a very useful man in an air pollution program.

Panel Discussion on Equipment and Laboratory Needs

Jack Baliff
B. D. Bloomfield
Morris Fisher
W. C. Galegar

A. E. Harsted
P. W. Jacoe
Edward Kosciuch
Ross Kusian

W. L. Lea
W. A. Munroe
H. J. Scott

JACOE: In order for those of us who are relatively new in air pollution work to profit from the past experience of others, it is necessary to begin now to standardize instruments, sampling methods, analytical methods, and methods of reporting. The money spent for instruments represents in most cases all that will be available for many years, therefore, we want to be sure we are buying instruments that will be recognized as suitable. It is desirable also particularly from a legal standpoint, to develop official methods of analyses and reporting from which comparisons can be readily made with other areas. Since, according to previous papers, the problem is of the nation-wide scope, it should be handled as such, rather than a series of individual unrelated problems. Perhaps we do have instruments and laboratory methods that are widely accepted, but they have never been designated as "official" by any agency.

KOSCIUCH: I'm with the City of Chicago, and I'd like to clarify one thing. I'm a combustion engineer, not the head of the department like some of you may have construed. A year ago, Tom Carey, the head of the department, decided that the city was backward which we are not ashamed to admit, and assigned me to investigate into research in the city about dust and what can be done. Two years ago they changed the name of the department from Smoke Inspection and Abatement to Air Pollution Control.

We've been working out an ordinance for a year and a half now, trying to find out which way we're to go. The way things are changing in Chicago, to give you an example of that, we've even had to go after parking lots to oil their surfaces so as to cut down the dust. We don't have the authority to do that as yet, but we've had to take it over. We've had to take the bull by the horns, as was stated yesterday, and stop the drop chute incinerator from going in as such, because of too many complaints. We're faced now with the problem of equipping ourselves to find out what is in the air besides dust, for which we have records going back to 1926. I brought some charts on some other work that we've done. They're not accurate, true, but we find that you can get an indication out of dustfall records to a trend pattern of a community. They seem to reflect the overall sanitary conditions that exist in a city. We find that in an area that is tending to become a slum area, the dustfall is going up; we find in an area that's becoming more highly industrialized, that the dustfall is going down. Change of equipment! In 1939, in Chicago, the railroad engines alone burned two million tons of soft coal within the city. Now they are 95 percent dieselized. This has changed the constituent of our atmosphere. I'm basically a mechanical engineer. I have to fumble to find out what kind of equipment we have to get. I'd like to be sitting down over there and listening to what's going on, but I'm just trying to find out where you start, how you get a decent little laboratory going when you don't have anything to start with. You're setting a precedent. In purchasing equipment, every politician wants to get into the act. If you're trying to create a new job, asking for chemist, right away the patronage committee gets interested.

If you make it a decent salary, then the boy who got the votes out -- a precinct captain who's been canvassing votes for 30 or 40 years -- will be entitled to it and the pressure is on.

I would also like to clarify the statement of "precinct captain". Chicago's progress has been accomplished through the use of precinct captains. The department has been able to instruct and train these men for proper combustion work, and has competent inspectors for progressive smoke abatement work. Now the complexities in air pollution work involve much more than combustion engineering.

To my knowledge there is no course offered as combustion engineering, nor is there a course being offered in "Air Pollution Studies". These all have to be faced by respective departments. I have found by direct contact with precinct captains, that better than 95 percent of them are way above average in intelligence.

Now I've had an experience on which I'd like to ask a question. We received a complaint about SO_2 damage, so we borrowed some equipment from the Health Department and from the Commonwealth Edison Company, and went out there and looked. People were complaining about plant damage on the southwest side of the city. We took the SO_2 samples — got a 1.3 parts per million count on the southwest wind. Stuff had been blown in from out of the city. I looked around at the vegetation. The grass was doing fine. The plants that got up to about four or five inches were doing fairly good. Anything that got over a foot, wasn't doing so hot. We kicked the soil around and found that the contractor had put in two and a half inches of top soil. There was a clay bank below it, and naturally, nothing is going to grow. Yet the people associate that as SO_2. Now what is the possibility of getting some kind of cheap indicator where you utilize known plant life for say, crop damage or plant damage, which the community can plant in various sections and compare how they grow? I do know that the Tree of Heaven, as we call it in Chicago, will practically grow anyplace.

STERN: What equipment is needed to set up the kind of laboratory they need in Chicago?

H. J. SCOTT: This problem of SO_2 is one that we do a lot of checking on in Cleveland. Back several years ago, the automatic impinger was developed in our laboratory, and is now being produced and marketed by the Automatic Sampling Company. Wilson, I guess, is the chief salesman, engineer, and manufacturer of this instrument. I think, complete, they sell for about $450. It will give you a sample every hour on the hour, and only requires about 10 to 15 minutes a day to take care of the instrument. Our laboratory has one that we keep in operation all the time, and there are eight other instruments that are kept in operation in Cleveland by industry.

But let's talk about this equipment business a bit. Actually, we have one of the leading laboratories, and ample equipment. We have some pretty good chemists, but actually when it comes to what the laboratory has actually accomplished in the way of control problems, I think it's very meager.

We have our Comapp Program, where we have some 11 industrial companies and the U. S. Weather Bureau, who have established stations for general air sampling. We have several Weather Bureau stations that determine wind direction, wind velocity, humidity, etc. So that we know pretty well what the micrometeorological situation is, with respect to air pollution concentrations. We've made a lot of studies and made a lot of reports. We've been able to predict the concentration of pollution 24 hours in advance, which I think is something that has not been done elsewhere. We know a good bit about our atmosphere, but as far as sampling, and being able to go out and specifically sample an individual stack and come up with an administrative procedure for enforcement, I think we're a long way from taking that data into court at this time, because of the variables involved and the methods of sampling techniques, that I feel at the present time are very hazardous if you ever had to go to court. As a result, in the eight years that I've been in the division, we've only taken two cases to court. We won convictions on both of them. One was an open fire violation. The other one was operating equipment without a certificate of operation, which I mentioned in my talk the other day. Actually, if you can issue a certificate of operation and have the right to revoke that certificate without any testing, and work primarily on the basis of the number of complaints received (justified complaints), and the fact that you can visually see the thing that is creating the nuisance, or you can determine it by one direction pretty readily, I think that industry will go along without a lot of sampling data or a lot of fancy laboratory equipment. I think that you can get along with a very meager amount of equipment and get your job done.

RAILFF: I think the whole question of equipment and laboratory points up the advisability of at least new programs in air pollution being handled by the existing industrial hygiene organization. The type of equipment is very similar — the techniques are similar, and I'm sure at least on a state-wide level, most states in this country have good industrial hygiene laboratories. All they need is a little amount of cash and a little extra equipment. Of course, you will need more field equipment than they normally use, because of the difference in the problem. For example, stack sampling equipment is similar to duct sampling equipment, but differences are necessary because of size, temperature, etc. It is the same type of equipment, the same techniques, and it is the same type of personnel to use them, so the whole deal, I believe can be simplified by taking an existing facility in the industrial hygiene organization and building it up to include air pollution, rather than start from scratch with nothing at all.

H. J. SCOTT: The Bureau of Industrial Hygiene is one of the sub-bureaus of the Division of Air Pollution Control in Cleveland, and I don't want to belittle the industrial hygienist too much or not give him credit where credit is due, but their methods of sampling are probably the only techniques that are published and acceptable. Of course, the American Society of Mechanical Engineers has published stack sampling data, but if anybody can follow it one way, there are 10 people who can follow it another way and come up with 10 different answers. One thing is sure -- at least 9 of the answers are wrong.

BLOOMFIELD: I'm with the Michigan Department of Health, Division of Occupational Health, and as a natural course of events, we've been taking on more and more air pollution work. We, as far as our staff is concerned, do not have serious problems. In regard to the recruiting of personnel, we have engineers from industry who have applied to us for work. Recently, we hired two engineers who were working in industry and were very happy to join us. As far as meeting salary levels, we pay more for a beginning engineer than some of the competing industries, so we have not had that problem. Contrary to this, we have and are having difficulty lining up a suitable chemist for a position that is available.

Aside from that I'm supposed to be talking about equipment, and specifically I might mention that we haven't found too much difficulty in interpreting the information provided in the American Society of Mechanical Engineers' pilot test code for sampling. We do a lot of stack sampling. We find that each problem in air pollution tends to be something specific. It's an individual problem requiring individual treatment -- problems varying from ammonium chloride to ordinary fly ash to flash drying sewage slush, and that type of thing. It's not just a matter of going in and looking the job over and getting the dust collector manufacturer and the owner or manager of a plant and some other people involved together, and telling them what you think, and have them go out and make extensive purchases. It's a matter of giving them actual scientific data which is what we attempt to do, and we would not do otherwise. We give them a complete report, when a complete report is available. We take stack samples. We interpret the data for them and give them information as to what we think they ought to have to do the job, and I'm not attempting here to contradict what someone on my left has said, but I think that what we need more of is a scientific approach to the problem of air pollution. As far as learning what equipment to have and where it might be purchased, and what type we should have, what are the opinions of the experts in the field -- all of this information is available. You can refer to the literature for the procedures of stack sampling. What type of equipment to use? -- You can go to people who are engaged in this activity every day, and ask them their opinions as to what they're doing -- how they're doing it, and what they're using. I think possibly the problem is that maybe we're not using the right approach, and maybe we're not using the resources that we have about us, but let's try using a scientific approach in evaluating data as it should be, in an engineering fashion.

STERN: I'm glad you brought this matter up (which group in various localities the Public Health Service should work through - ed.). If the decision of the State of Washington is that assistance to it shall be through the State university, that decision is the State's, and therefore, is the one we will follow. Determination as to what agency in the State represents the State in its air pollution activities, is entirely a matter for the State itself to decide. I hope that before you get out of Cincinnati, you give us an opportunity to get together with you, and explore how we can be of assistance to the State of Washington. We already have received several requests for assistance to cities in Washington. The intent of this meeting is not to break down Federal aid into small chunks by sitting down and parceling it out State by State. We have been holding discussions with States, and I hope that those of you who want to get into specific discussions will have time to either stay over tomorrow or the next day, or will make a date with us to meet either here or in your own backyard. Please don't go home feeling that your problems have met no responsive ears here, or that we have singled out your State as the one in which we are not interested. That's not so.

FLANAGAN: Mr. Stern, I wonder if I could add something that would be of benefit to the man from Chicago. This business of utilizing local resources was touched on by Mr. Bloomfield. I don't think that my friend from Chicago would mind if I suggested that when you get back there, and if you don't know him, you look up Dr. A. Setterlind in the Illinois Department of Public Health in Dr. Shaughenessy's laboratory. Dr. Setterlind has been in the industrial hygiene and air pollution business for years. He knows the instrumentation game from A to Z, and I think he could give you, and would be willing to give you, a good bit of direct help. The other possible source of assistance, is an industrial hygiene unit with adequate personnel in the Illinois Department of Labor, right in the center of town. I think from those two sources you could get a combination of advice from people who know Chicago, and who know the Chicago problems, and it might help you a good bit.

KOSCIUCH: We've had wonderful help from Dr. Setterlind. Unfortunately, Dr. Setterlind has only got eight hours in a working day to get around. I have about the same amount, and in order to try to get my 8 hours done, it usually takes me 11. What I was trying to bring out was we do try to enlist the help wherever we can, but we do need a simplified means of taking samples. Now for example, our dustfall work; we have utilized on our 25 stations wherever possible. We try to get a representative area. The Illinois Bell Telephone Company has uniform buildings. In the early experience in the department in 1925, they put the jars up on the street corners on top of lightposts. Well, the kids with sling shots and B-B guns, etc., — they were no good! We tried using private roofs and used Pyrex battery jars, 6 inches in diameter and 9 inches high. They made wonderful planters and fishbowls, so they disappeard. The Illinois Bell had a guarded roof and the personnel were informed of it, and we get uniform results. In other words, we really lose maybe 2 percent of the jars out of 25. Once in three months we lose a jar, and then it's sometimes once in four months and that's only due to accidental spillage in the laboratory. Coming back to the jars and analyses, we had an experience this way. The City of Chicago (Public Health) did the analysis for us for a number of years. Their staff became overcrowded with the interest in food problems, the analysis required, milk and other determinations around the city, so then the People's Gas and Coke donated their laboratory for a while. Well, they got a little burdened, so then Edison took over, and now we have the kind assistance of Armour Research, so the analysis for us is free of charge. We had the trouble for years with the press in Chicago on dustfall figures. Every time we let go of a news release on the dustfall figures, there was an editorial "Adulterated dust figures released by the City of Chicago." Alright, so we had to go and educate the press. We educated the Tribune to the point that, by pointing out to them when they called us a liar, they were calling Armour Research a liar,so when they checked back and found out about it, we've gotten cooperation that way. Now we get support from them. The other thing we're interested in -- the press comes around and says, "Well, how does Chicago compare with New York, Pittsburgh, and the other cities?" We don't know and we don't care -- we're interested in trying to compare one area in Chicago against another area because each city has its own problems and its own combination of circumstances. Now coming back to the plant life and the handling of the sampling in the jars -- well, the jars are simple. You can put a precinct captain out there to handle them. He doesn't have to be educated in handling complicated equipment. Now SO_2 affects various plants in different manners. I understand that buckwheat is supposed to be affected with concentration down to 0.4 parts per million. So, if you have a series of plants with known effects, carefully grown and planted around the city, you can watch their progress as they grow. It seems to me that you don't need a lot of SO_2 recording equipment to be out 24 hours a day, and to have a specialist there to run it. All you need is somebody trained to recognize when the leaves are affected.

WILLIAMS: I feel that an "informational vacuum" has existed in respect to Illinois since Mr. Flanagan's remark in reply to Mr. Kosciuch's comment on SO_2 sampling. Well actually, Dr. Setterlind is glad to help Mr. Kosciuch, and he does it whenever possible. Dr. Setterlind, in fact, also helps other people, but you know we have absolutely no authorization to do anything. We have no administrative support, and year by year, our equipment and such dwindles. On the matter of plant life, we have a State Natural History Survey that is excellent, and I'm sure they can help on such things. We have good research people at Armour Institute. We have Dr. Johnstone from the University of Illinois. We have many resources, but our problem, and I bring it up not so much because it's in Illinois, but because I think it's quite general; we don't have administrative support, and I think maybe we should direct a little activity toward getting that administrative support, because until we do, we can't do too much. You can only go so far in spite of organization, instead of because of it.

PICKARD: I hope that either I don't go home misled, or the gentleman from Washington doesn't go home misled. It was my thought that the university should be advised by the Public Health Service that the State Health Department would be their initial contact. My understanding is that the Public Health Service follows the line of contacting individuals and corporations within a State through the State Health Department. Now, if that be the line of procedure, I think that he should be so informed, and if not, why then I ought to go back home prepared to change our thinking in the matter.

MAC KENZIE: I talked this morning on Federal-State relations, and stated the general objectives of the Public Health Service's Air Pollution Program. In terms of the Act passed by Congress this year, States or local agencies are free agents in requesting technical assistance from the Public Health Service. As a matter of policy, we believe that all the resources available should be used in dealing with air pollution problems. We believe that the State is an integral part of the overall picture and should carry an important part of the burden of handling air pollution problems. It is our intention to encourage the State to be drawn in on the technical problems and to fulfill the prominent part that we think it should, and which we believe the States also think they should fulfill. Nevertheless, as an agency of the Federal Government, we cannot channel all requests for technical assistance through the States, nor can we prevent a private citizen or any organization from coming to us and requesting assistance to which they may be entitled under the terms of the Federal law. Insofar as we can guide the operations along the principles that we have indicated, we intend to do so, and we hope for the cooperation of the States and the local agencies in carrying out the program in that manner.

Necessarily we will have direct dealings with industry, direct dealings with individuals in our program. I don't know whether this answers the question in toto. I think all we can do is indicate the general principle and the legal obligations under which we operate.

H. J. SCOTT: There is another problem that we have not delved into besides this business of mechanical engineers versus industrial hygienists, which has been going on for some time here, and that is evaluation of equipment. I think that the Federal group coming in here evaluating equipment can do us all, regardless of what we are or who we are, a lot of good in being able to accumulate reliable data on the various efficiencies of equipment and procedures for determining proper application of that equipment -- whether it's test equipment, or whether it's production equipment. I think that that is one thing that we are severely lacking in at the present moment, and I think that the proper application of individual component parts is something that we're going to have to go into thoroughly with true evaluation of engineering facts and analyses. I think it is an administrative matter to allow the divisions to know what equipment can be installed -- where, and for what purpose.

I don't think there is enough standardization of individual component parts being put together to do a job where they assume that the air pollution control man is an expert, and he should know all the answers — he just can't possibly know all the answers without going to somebody for some help, and I think here at the Taft Engineering Center there's going to be a wonderful reservoir for that help, and I'm looking forward to a lot of help from that respect.

BLOOMFIELD: The air pollution people can help a lot in evaluating equipment. This job of determining just what collector or what piece of manufactured equipment will do a certain job, is not as easy as it sounds, and it's a matter for all of us to get our people into and test the equipment that is actually being used, and come to some conclusions as to its applicability. Furthermore, I think the dust collector manufacturers have a lot to contribute in this field, and I was happy to hear Mr. Ballman mention that there is a possibility of setting up a laboratory for testing prototype equipment so that some data is available as to whether or not a dust collecting unit will do a certain job. Also, I might mention that there is some information already published on performance characteristics of some manufactured equipment.

GALEGAR: There is a definite need for assembling the available information regarding the various types of field and laboratory equipment pertaining to the air pollution field. It would seem that a compilation of the basic equipment needs, such as has already been prepared for laboratory equipment in the industrial hygiene program, would be of great use. This information might be presented in a manner similar to Public Health Bulletin No. 236, "Evaluation of the Industrial Hygiene Problems of a State."

STERN: In summary, it seems that one of our needs is a bulletin describing air pollution laboratory and equipment similar to that bulletin published by the Public Health Service some years ago in "Evaluation of the Industrial Hygiene Problems of a State" which describes a typical industrial hygiene laboratory.

Panel Discussion on Budgetary Needs

H. C. Ballman	P. W. Purdom	J. D. Williams
C. M. Everts	A. Rihm, Jr.	

STERN: Our subject is the cost of operating air pollution control programs. Perhaps people in cities and states, who have recently prepared budgets, can tell us how to estimate what this equipment, personnel, and expense is going to add up to.

PURDOM: I perhaps am a little new to the field of air pollution, having been connected directly with it only about a year, but I think that many of the problems of budgeting are common to all types of programs. One thing that you have to do if you expect to get budgetary support, is to consider what the budget represents. In other words, you have reached a point in State and municipal financing where you don't go down and ask for so many thousands and so many millions of dollars, and have someone just hand it to you. By the same token, it's not a very good argument to go in and ask for a hundred thousand dollars because our neighboring city over here is spending seventy-five thousand, and you want to outdo them. That might have appeal in some sections, but usually you find cities bragging about, at least administrators, how little they spend, especially when the executives go out and run for reelection.

So, when you consider your budget, you don't need to think in terms of dollars immediately, but rather what those dollars represent, and what you want to buy in the way of program. I think that something that's been talked around all day today, and we haven't really touched upon, is how you develop a program. We've talked about various components and elements of the program, but what makes you need personnel? — Why do you need laboratory equipment? I think that when you begin to plan a program that you have to have these specific purposes in mind. What kind of job do you expect to do? — What services are you going to render?

If you're in a State or municipality that is starting a new program, your problem is different than if you have an existing program. In the first place, you may not know as much about your problem and what you need to have in the way of a program, if you've never had one before. How do you find out what your needs are if you've never operated in this particular area?

Of course, one good and effective way is to let the people tell you what their needs are. Many of us, when we become administrators, are inclined to think we know what is good for the people and what the people should have, and are inclined to tell them. Occasionally they tell us. If we are really alert, we will develop techniques to find out what the people want. Do they want a smoke control program? Do they want a complete air pollution control program? Do they want to clean up the air, even if it means having to move some industries out of that State or out of that city? How far do you expect an air pollution program to go?

You'll find it very difficult trying to decide these questions yourself, and you shouldn't decide them. The people themselves should decide what they want, at least in the type of Government we have in this country. One very effective way of ascertaining this is through such devices as public hearings or advisory bodies, or things of that type. Then when you find out what you're going to give the people in the way of service, what they want, what they're willing to buy and pay for — then you can design a program and you can lay it out.

As technicians, if the people want to buy laboratory service to make surveys and find out what's in the air, you can design a program for that purpose, and tell them how much laboratory equipment you need — how many personnel — how many manhours it takes to provide that service. If they want an enforcement program, that means you've got to have men that can observe violations, can track down the source of pollution, and if necessary, prove that it came from this stack and that it was excessive and harmful. To do that, you need certain laboratory equipment and certain personnel. You need transportation. You need clerical services. All of these things have to bear a certain balance. It won't do you much good to build a laboratory and buy a lot of equipment, if you don't ever put it to use. Some day someone may come around and look at the laboratory equipment sitting on a shelf and wonder what you bought it for. By the same token, it won't do you any good to have personnel, if you don't have money to pay their transportation to the field locations where they do their work. Neither will it do you too much good to have personnel that can't work effectively, and part of working effectively would be having necessary laboratory equipment.

I like to think that what we do is wrap our programs up in neat little packages, and just like a merchant, set them out for the citizen to look at. Then you tell him what's in this package, and what it will do for him, how much it will cost, and he decides whether he wants to buy it or not. If you sell it on that basis, you'll have public support. If you don't have public support, I don't think you can do a very effective job.

There might be ways of comparing what different places do, but those are usually misleading because cost depends on the service that you provide. It happens that in Philadelphia this year, we have a budget of one hundred and twenty thousand annually, which is about six cents per capita. We have proposed that our needs over the next five years would require an annual expenditure of around thirteen and a half cents per capita, or about two hundred and seventy thousand. We developed this by actually figuring out the manhours it would take to do certain things, and what equipment would be needed to service them. We now understand that there is to be recommended in our budget an increase to go up to ten cents per capita, which is about a seventy-five thousand dollar increase.

It's going to be a problem to us to spend this money, and spend it wisely because you don't get personnel immediately. If you get too large an increase in budget, you will be faced with the problem of spending it. Part of the early expenditures can go to equipment while you are recruiting personnel. That is what we are doing our first year. You have just as much concern to avoid over-budgeting, as you do under-budgeting because legislative bodies do not like to budget money for it to be surplus. It increases the taxes unnecessarily.

Those are just a few of our experiences. You might say that we have, at the present time, about one person per hundred thousand population, but I don't think figures of that type mean anything, because it depends what your local problem is on what you do -- what kind of service you render — what is expected, that determines how many personnel you need.

EVERTS: Perhaps some of our experiences might be helpful to representatives of cities and states who are present. Frankly, when we entered this activity in air sanitation, we weren't exactly sure what our problems were. We had received a few complaints, some were legitimate and others were not, and when the Act was being drawn, a tentative budget had been prepared, and for my money there are two kinds of budgets; one that you'd like to have, and the other one that you make after the appropriation has been given to you. We thought that the hundred and ten thousand dollars which we had tentatively established as the minimum amount of money on which we could operate an effective program, was what we should have had. I think industry, in general, agreed with us on that point in 1951 when the Act was up for consideration. However, because of the lack of any factual information on the problem in Oregon, I suspect that the committee of the Legislature who was reviewing our budget, decided that anything over a hundred thousand dollars looked pretty large to them, and they suggested that we reduce that budget to something under a hundred thousand dollars. We did, and we came up with a figure of $99,900. That was an honest request, I think. It involved a reduction chiefly in personnel. By the time the Act was adopted and the amount we were given to operate on had been determined, we wound up with about $90,000, which was sufficient for the first couple of years of operation. It gave us a chance to get our feet on the ground, and to actually try to determine in what areas the problems existed, and the nature and extent of the problems. By the next session of the Legislature, we found that we could get along with about $85,000, instead of the $90,000, principally because we were on a program, still, of study and investigation. We had taken some action in a few cases but we were not quite ready to expand the program, and our communities weren't quite ready for the type of assistance that we were then able to offer.

On budgetary matters, of course, we have three factors to consider. One is the salaries and wages of the employees, and the second is the operating expense for office, for staff, and for equipment. The third one is capital expenditures for the purchase of equipment. In the first budget, we had set up some $20,000 for laboratory and field equipment. We held that line very tenaciously, thinking of course that since we were going to embark on this new venture, that we needed all sorts of new gadgets to sample the atmosphere. We wound up spending about $6,000 of that $20,000 in the first 2 years. We, I think, made a rather careful study of equipment available. We did buy some equipment. We used it. We found that what we had bought did not always lend itself to use under outside atmospheric conditions, with exposure to wind, rain, dust, and all of the other conditions that occur when equipment remains outside for days on end, particularly equipment that cannot be located under some sort of protective covering.

The next time that we went to the Legislature in 1953, we did have some facts. We knew about what type of personnel and equipment that we were going to require for the next two years of operation. We received a much more cordial reception; they were willing to listen to us with a little more appreciative ear, and we had no difficulty obtaining that next budget. I suspect that as time goes on, as the problems are met and solved, and as new ones arise, we will have developed a higher degree of confidence in our program. I think that's probably the most important factor in budget preparation, budget defense, and ultimately, in obtaining the amount of money that will be needed. There's a need for the development of confidence among those people who are going to support a budget, and among those people that are going to listen to and act on a request. If a program has been carried on in a workmanlike manner, on an efficient basis, if results have been accomplished, and it has the support of the people, and the people to whom your budget is presented have confidence in your ability and the integrity of the program, the budget request is more likely to be approved. It's been our experience not only on air pollution control, but on water pollution control, on water supply sanitation, and any of the other environmental health programs, in legislative hearings for budget requests, if they have a reasonable confidence in what the program is attempting to do, and can see some end results, the problem of getting the money is going to be somewhat simplified, if the money is there to be made available to you. Unfortunately, there are times when states and cities get into financial difficulties because of a rapidly increasing population, and there is a demand for more service coupled with an increase in costs of government. You may not get sufficient funds every time you make the request, however, with good, long range planning, certainly you are going to have a much more sympathetic ear under the conditions that I have attempted to describe, than you would otherwise.

WILLIAMS: I want to emphasize what Mr. Purdom has said. I think that's the crux of the matter -- to set up a package -- let people see it and let them decide whether or not they will buy it.

I wonder if they didn't put me on this budgetary item because of what happened in Illinois with our legislative commission to study air pollution. The bill which formed this commission was introduced two years ago and was enacted into law. The Governor looked at it and apparently thought it sounded like a good idea, but considered it would be a better idea if the appropriation was vetoed. Which he did! Then he made a little statement in his veto message, that all the talents for making a report on this matter could be found in the Department of Agriculture and the Department of Health. So, he left us definitely on the hook, and one of the things that we have done during the two year period is prepare a package, as it were, of what the problem is as we see it, what it would take to solve some phases of it in the way of personnel and in cost. The only place we are hung up is that we don't have any way to get our wares on the market. That again falls in line with your idea, Mr. Purdom.

It might be of interest to note, I know it was to me, that we followed pretty close in our staff requirements to about an equal balance between laboratory and other personnel. We anticipated that the people would buy a program costing $121,000 the first year, and $76,000 the second year, with a bit of a factor to allow for what might be chopped off.

BALLMAN: I think the area has been very well covered. The fact is this discussion on budgets is intangible. In summarizing, your first consideration should be the impact of a problem in your area that brings the people of a community behind the matter of budget. Governmental agencies or legislators will not spend money unless there is a force to get them to spend it. Unless the people in large numbers want something there's not going to be too much money spent. This is particularly true in the early beginning of a program. Later, as has been indicated, you have to wrap up the package and keep it going. A favorable legislature is definitely necessary, and you just might as well forget budget if you don't have the impact of a favorable legislature. This has to first come to pass.

I can't say too much about the needs for State program. You only have five States that are directly active in air pollution; none of them are functioning in the same manner, and I think their personnel and equipment requirements are all quite different, so establishing a pattern for a budget would be quite difficult.

I'd like to jump over to the local needs which are more readily established. In 1952, the Air Pollution Control Association had a statistical tabulation of the major cities of the country showing ordinance requirements, budgets, etc. Figures from this recapitulation indicated that per capita cost per community will range anywhere from about a low of 3 cents and a high of close to 20 cents per capita. Here are represented a whole range of size of cities. If you have ten thousand people, it's going to cost you a lot of money per capita. If you have five million people, not so high a cost per capita. Again, what's the breadth of your program? What's the problem? What's the impact of the people? It's awfully hard to come here and just say, "Here is the budget for the average Governmental agency.", because there is no average community.

May I emphasize one thing that's been touched on here. Do not overburden your first year budget for equipment. This may lead to two difficulties: one — you're not too sure just what equipment you may require; two — you don't have the manpower trained for it, subjecting you to possible criticism for not using what you have. It has been found to be good practice to put a small fixed amount for equipment into the budget for each of several years. This spreads your total estimated equipment budget over several years. Buying equipment periodically over several years, allows you to develop its usage as you buy it, and in addition, reduces the total amount you to have to ask for at any one time. Over 5 or 10 years, you'll have far more usable equipment, without leaving the legislators with the impression that you're a big spender.

STEAD: Would it be out of order to ask if you could give us some idea of the budgetary proposal of the Service for the next fiscal year.

STERN: I'm sorry, but that is something I can't do.

GILBERTSON: I'd like to comment on a point that relates to that, Mr. Stead. I think we ought to make it quite clear, that Public Law 159 does not contain a matching grant provision, as do many of the other Public Health Service public health acts of the Federal Government. We, therefore, do not want to leave the impression here that that provision would be implemented, because there is such a provision. Mr. MacKenzie, in his discussion this morning, did raise a question which relates very closely to that, and that is, is it desirable in this field to make provisions for what might be known as Grants for Demonstrations or some sort of special projects? This is a question which is being mulled over. We do not now have such a provision, as you saw from the figures in Mr. Stern's presentation yesterday. The amount of money available this year does not include either sufficient funds for that, nor did we actually plan it in this first year of operation. This is something on which we would like to have some of your comments. We are now in the progress of working through the figures for next fiscal year. As you know they are "administrative confidential" information, until they are in the President's budget when he presents it to Congress. However, we are very hopeful that a substantial increase can be made available.

BALLMAN: May I ask a question about these demonstrations? Would you enumerate one or two or three demonstrations? Have you got that in mind? What constitutes a demonstration? What is the area of demonstration?

GILBERTSON: Well, there are a variety of types of demonstrations that have been undertaken in the past in other fields of activities. To name one or two: to demonstrate specific approaches, in other words, either technical or administrative approaches to the solution of a problem, either on a state-wide or a local area basis. Now that would be an example. An example of another type of special project would be a study to determine needs in an area. That's another kind of special project.

PURDOM: I'd like to ask a question. Is the Public Health Service going to be able to accumulate data on budget needs, (i.e., requirements for personnel, training, and the cost of such personnel as might be experienced by various states and local areas), assemble that information, analyze it, and make it available to the various areas that are interested?

STERN: That is one of the things that we definitely are including in our State and Community Services activity. The very first of that sort of thing is this very simple directory of agencies which was put into your packet today. We hope to follow this up with other similar services, such as statistics on the number and kinds of personnel in agencies, the sorts of information you need to have in order to intelligently run your program, and compare your program operations with those of other areas of the United States.